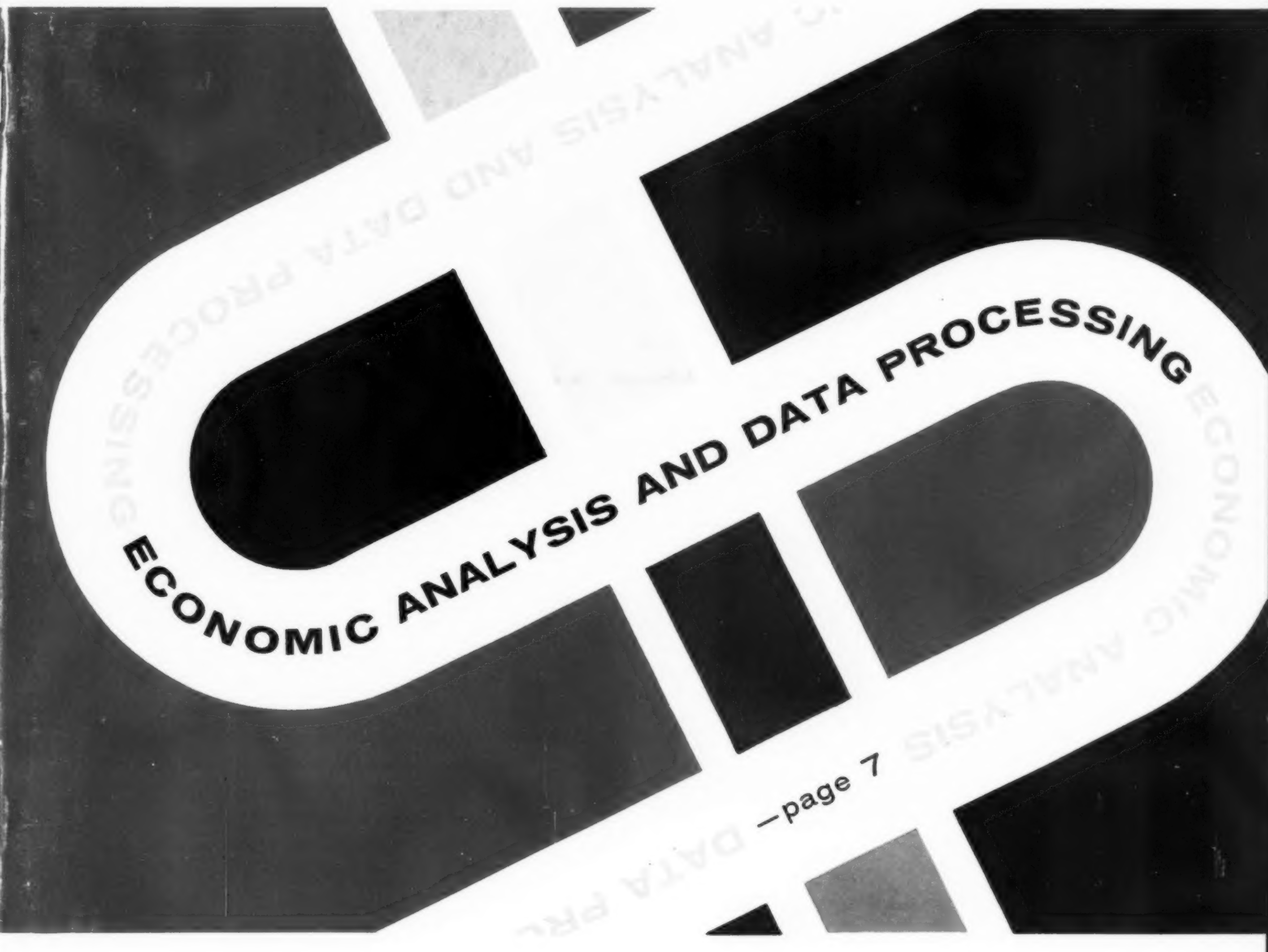
MAY 1961

DATA PROCESSING®

THE MAGAZINE OF AUTOMATIC OFFICE METHODS AND MANAGEMENT



DATA PROCESSING

Volume Three • Number Five

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OBSERVATIONS . . .
from the publisher

EDITORIAL DEPTH

WE EMPLOY FIVE FULL TIME STAFF EDITORS. Each is well qualified both as a technical person and as a writer. The least experienced of these has nearly ten years of background in this field—the most experienced over thirty years. This is more than twice the number of full time editors employed by any other publication in this field. Some publications show a list of editors in their "masthead" as long as your arm—but very often these are merely the names of persons who have allowed their names for publicity and contribute little or nothing to the magazine.

In addition to the full time editors we have five associate or contributing editors who regularly participate in supplying material for features or assist in overall planning.

It is interesting to note that besides the efforts of these ten "staff" people, ninety-seven other persons have written material for DATA PROCESSING. These persons' initials include every letter in the alphabet except QUXY—from Anderson to Zino.

All of this material has been paid for at a rate higher than the national average for business publications. Every article has been solicited by our editors or otherwise selected to fit a balanced editorial plan.

The most important consideration to our editors is that material presented in DATA PROCESSING has proper respect for your time—that every item is of sufficient value for you to take the time to read it.

We call attention to this now because thousands of new subscribers have been added since our last reference to editorial content.

Frank H Gille

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AUTHORS

G. EDWARD BISSELL (*Economic Analysis and Data Processing*) is a graduate of The University of British Columbia, Vancouver, B. C. with a B.Com. degree and earned an M.A. degree in Economics from the University of Ottawa. He gained auditing and accounting experience in Edmonton, Alberta with Winspear, Hamilton, Anderson and Company, a firm of chartered accountants, and with The Royal Bank of Canada. Mr. Bissell served with the Royal Canadian Air Force in various responsible supply officer positions and as a systems and programming analyst with the RCAF's large scale electronic computer installation in Ottawa, Ontario. He wrote several computer programs and developed the installation's standard operating procedures manual covering programming techniques and procedures. He is now systems analyst with Remington Rand Univac, Toronto. Mr. Bissell's article, "Measuring Programmers Effectiveness," was the cover feature of the August 1960 issue of *Data Processing*.

NORMAN BUSH (*Questionnaire Analysis by UNIVAC*) is a graduate student in the Department of Statistics, University of North Carolina. Prior to returning to graduate school in 1958 he was employed as a statistician for RCA Service Company at Patrick Air Force Base, Fla., and also for the Army Chemical Corps, Edgewood, Maryland. He received his B. B. A. in 1951 and his M. B. A. in 1952 in business statistics from City College of New York.

ROBERT A. LINK (*Ledgerless Punched Card Accounting*) is manager of the statistical department of the Billboard Publishing Company in Cincinnati. A native of Ohio, he graduated from Ohio University, School of Business Administration, and also attended the University of Cincinnati Evening College and Xavier University Evening College. He managed several data processing installations before joining the Univac Division of Sperry Rand. From there he joined the staff of the Billboard in his present capacity. Mr.

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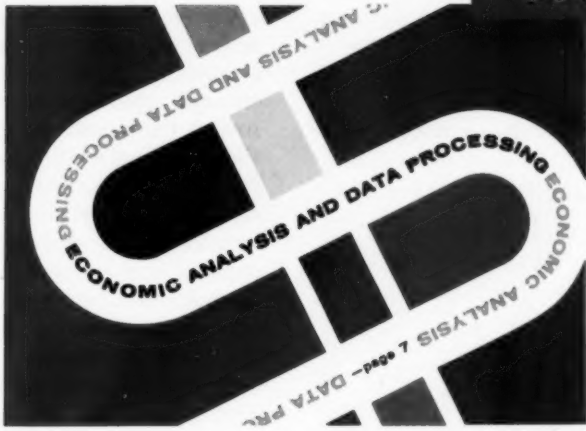


Economic Analysis and Data Processing

Company economist has role in planning stages of data processing progression.

OUR OBJECT is to explore the relationship of economics to data processing and to establish areas in which the economist may exercise his profession in the creeping evolution facing office work. Additionally, we will consider the extent that data processing reflects a firm's long term development program.

Role of a company economist

First we should establish what part a company economist plays in business matters and then we may see how his work fits into the data processing

By G. E. Bissell

sphere. Economics concerns the allocation of resources—material, land, labor and capital in a manner so as to achieve an optimum combination of productive factors and gain maximum returns for the owners of the productive factors. Productive factors by nature can only be redistributed in the long run (*a number of years*), so economics is a study concerned with the long term period. Since economics embraces a study of all production factors and design of methods to combine them in a most effective manner, then the economist must be a designer of company policy and must be involved in long term company development plans.

The economist must know the trends in business and production characteristics. He assesses the influence of external business conditions; changing fiscal and monetary policy, population trends, extent of family system, attitudes of people and patterns of income distribution upon the firm. Internally, he assesses the development characteristics of the firm and of the industry in which the firm is situated, the trends in union contracts, material sources and supply and mechanization investments, so that he may predict the course of a firm's economic growth. In order to do a good job, the economist must possess current knowledge in management techniques, data processing technology, production characteristics and market trends, and be able to assess the impact of each of these factors on a firm's development. He must be a business administrator with an eye to costing the utilization of every resource which may be altered in the long run period.

The economist is in a position to analyze the trends in production and management techniques

and to single out areas in the administration processes wherein improvements to data processing efficiency and effectiveness may be gained. Some understanding of the manner in which the economist may assess potential data flow improvement areas may be gained by first understanding the characteristics of data processing.

Character of data processing

Data processing is essentially a servicing function which supports and assists the primary operations of a firm. It involves such clerical operations as transcribing, computing, transporting, documenting and filing, in communicating informative data from one operation to another and from one time period to another. These clerical processes may be performed manually or by a varying degree of mechanization or automation. Data may be processed by a variety of office equipment, from adding machines and desk calculators to electronic sorters and computers. Clerical operations may be performed directly by manually operated machines, or indirectly by machine control as the by-product of being activated through common or native language media from other machines. Operations can therefore be autonomous processes or interdependent and interrelated processes. The successful utilization of connecting machines in activating one another, and in contributing to the automatic processing of data, depends upon data processes being interrelated. The more interdependent operations are, the more continuous the mechanized flow of data. Continuous or automatic data processing thus is largely influenced by the characteristics of data processes

There are other factors which influence the character of data processing and which must be analyzed for the most effective utilization of data processing equipment. Such considerations as the level of clerical efficiency as measured by error ratios and time utilization, the economies of mechanized processes as compared with one another and in contributing over-all benefits to the firm, the amount of budgeted funds available for mechanizing clerical operations, the firm's approach to system planning and long term data processing development, all bear on the analysis required in assessing use of mechanization in data processes. These are essentially economic considerations in appraising how the factors of production are combined to attain the least cost combination of production for the maximum returns to the owners of the factors of production.

Data processing and economic analysis

What then are the economic considerations in, and why should we be concerned with, such a scientific analysis of data processing? When one views the increasing proportion of operating costs attributed to processing of management data as business volume expands, then one may readily appreciate that this production area contains substantial savings potential which may be discovered through rigorous analysis. As an organization grows, the portion of operating costs consumed by the paperwork and clerical processes rises at a faster rate than the costs of the productive processes. Unless a plan is devised to reduce the proportion of these administrative costs with business expansion, then general confusion and degeneration of internal working relationships will develop, office bottlenecks will appear and loss of customer good will and business will be the ultimate result. Therefore, it is important that a master long term data processing development plan should be devised to accompany corporate growth to prevent the development of chaos in the administration processes.

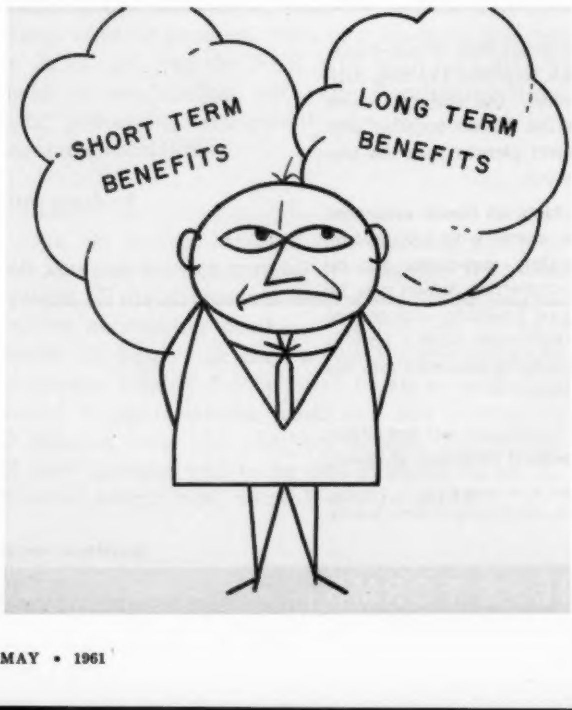
Pressure to uncover prospective savings areas often results from increasing union welfare demands and levelling out of returns from sales. As the profit gap narrows, the economist is pressured into critical analysis of production facilities in searching for ways to cut production costs, and one area soon becomes evident—efficiencies which may be gained in the clerical processes. Additionally, increased business demands a substantial amount of flexibility in administrative processes which can only be attained by optimum clerical efficiency and by introducing automation at the most propitious time. It therefore seems evident that economic analysis has an important role to play in data processing.

An economic analysis should assess the character of a firm's growth and potential development, then make a detailed analysis of data processing. An understanding of the growth potential inherent in an industry will provide an exacting basis on which to assess the impact of data processing efficiencies on a firm's profit expectations. The role of the company economist in this analysis is apparent. He must establish whether the industry and the firm are in an increasing, diminishing or negative returns phase of development; whether outside influences are conducive to data processing research and he must develop compensating development plans for the firm over the long term period. This embraces a study of company size and the size of data processing equipment which could economically be justified during each stage of development; establishing areas for research and data development and determining phases of system design which will complement one another and which should be developed simultaneously. This further involves establishing those factors of production which require extensive data processing support and determining areas in which data proc-

essing services may contribute substantial savings.

A comprehensive system survey will give the economist a complete understanding of the administrative processes so he may pursue the subsequent involved analysis required in developing data processing plans. Developing a data processing plan entails designing a system which will integrate compatible processes. Specific data flow stages must be analyzed to appraise what they will contribute to the system in increasing efficiency with various degrees of mechanization. Interdependent processes will, of course, produce less direct benefits through automation than will processes that stand by themselves; however, automating interdependent areas may contribute more to the system than is initially apparent. Any analysis should therefore establish the system-wide benefits to be obtained from increasing the efficiency of and automating specific interdependent data flow stages. Additionally, the long term benefits rather than the immediate benefits should be established. The economist should realize that assessing automation in terms of immediate short term benefits leaves his analysis open to disregarding the dangerously and obvious negative economies of worker dissatisfaction and displacement, retraining and relocation costs, severance benefits costs, organization inertia and reluctance to assimilate automation, etc.

The character of data processing in each stage of data flow will be influenced by the allocation of budgeted funds toward automation equipment and an assessment of those stages which will most effectively utilize the equipment; however, this analysis is again influenced by the contribution that each stage of data flow makes to the total system.



Data processing development plan

The role of data processing in designing a firm's long term growth plans should not be underestimated. Flexibility in an organization is the key to development plans. Flexibility and decreasing average costs in the clerical processes should be the objective; this may be attained providing that data processing development does reflect extensive economic analysis. Without a planned system, a firm will experience mounting fixed costs, rigidity and chaos in the administrative processes as business expands. Long term plans should reflect flexibility by culling ineffective and inefficient procedures, and should reflect decreasing average costs through introducing mechanized methods of processing data. An optimum allocation of resources wherein ineffective procedures may be eliminated involves programs for raising clerical efficiency through work measurement, office layout and forms control projects, and projects for increasing the efficiency of data flow through adoption of the integrated data processing concept.

The plans must also estimate data processing requirements at each stage of corporate growth and must schedule in resources required for continuous growth at the time that such factors are required. The plans must further stipulate which resources are available for reallocation in the short term period during changing conditions and fluctuating business within each phase of growth. This may entail plans for variable labor and typist pools, access to service bureaus for temporary peak loads and using leased equipment in the short term period.

The economist should further delineate those factors which may readily upset or alter growth plans and which will require constant assessment and reappraisal. Such factors would be development of new products, new management and clerical techniques and technologies, business conditions, government policies and population characteristics. Formulation of data flow development plans may be directly affected through a variation in any of these factors, particularly if the plans involve capital expenditures in data processing equipment. Continuous economic analysis of business conditions and of a firm's development characteristics is therefore required. Reallocation of such productive variables as administrative resources, filing system requirements and office equipment layouts may be required in adjusting plans to meet changing environment conditions.

It is therefore evident that a firm's potential growth is influenced by the control and foresight reflected in the data flow processes and that an optimum allocation of resources may only be attained in the long run by planning for business expansion. Such foresight requires substantial economic analysis and development planning. ■

MOORE SYSTEM OF THE MONTH

"MOORE FORMS HELPED US AVOID A 49-WEEK PRODUCTION DELAY"

—says J. A. Gorgenson, System Man-of-the-Month and Skybolt Program Manager at Douglas Aircraft Company, Inc.

"**THE SETTING:** Production of our Skybolt missile is, in one sense, the control of statistics—millions of man-hours to be analyzed, 20,000 events to be coded and computed. Our former system used three different typewritten forms, with inefficiency, errors, and an 8-day time lag. Our arrangement now, using a single continuous form, rises above production delays and forecasts man-hour needs accurately. In the Skybolt project it anticipated a 49-week delay sufficiently early to permit taking corrective management action.

THE SYSTEM: It is a computer-analyzed review of every detail of production. An Engineering Status Report is the key document, showing engineering management the progress of jobs. It includes—original estimate of man-hours, hours charged the previous week, total hours to date, estimated hours still to be expended. The statistics come through the group planner and are carded, together with stored constant data. The project planner sees the program-wide picture in the print-out.

He reads up-to-the-minute facts on hours, estimated vs. actual; worker performance; costs. With this control, forecasts can be made accurately, man-power can be assigned and, where needed, corrective action can be taken. The form is Moore's 4-part Speediflo—our control in print. We found the Moore man quite helpful, both in his understanding of data processing problems and his knowledge of forms constructions."

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APPLICATION OF THE MONTH

By Robert A. Link

Ledgerless Accounting

Accounting and payroll operations are handled on one machine.

TO SATISFY CURRENT NEEDS resulting from a growth in our operations, it was imperative that we revaluate our accounting systems and procedure. Most of our records and calculations are keyed to specific divisions and/or departments, and subsequently interpreted into profit and loss statements by product. The new machine selected to do the job was the NCR 3100 with tape attachment in conjunction with our Remington Rand data processing equipment already in use for accounts receivable.

Old method

Our old system involved one machine for payroll and another for general accounting. With this system, all disbursements were made to the journal on the accounting machine. At the end of each month all entries to each account were manually recapped, totaled for a trial balance, and then posted to the operating profit and loss statements or balance sheet. In addition to this, the balance of each account had to be posted again to an individual ledger card, totaled, and balanced.

New method

Utilizing the NCR 3100 accounting machine with tape attachment, additional work can be done in our accounting department and more information is available. This system allows us a combination of hard copy entries in the journal, plus a paper tape which automatically produces punched cards. From these cards we produce a complete detail listing of entries by account.

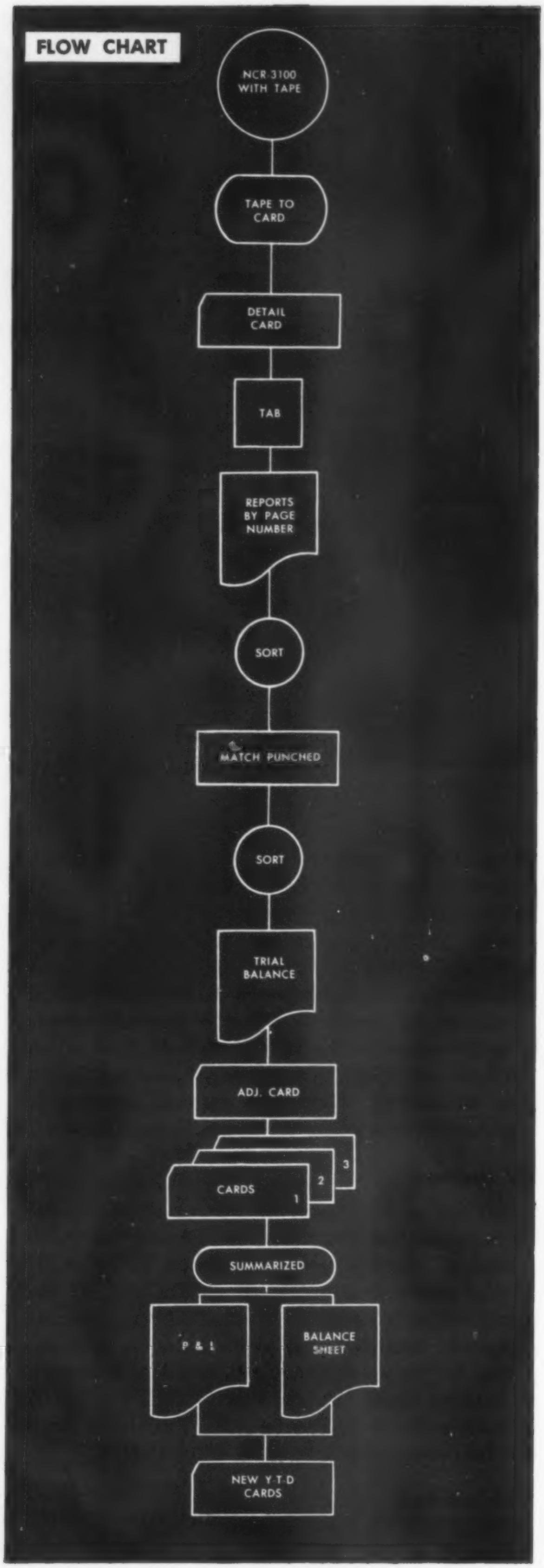
With the flexibility of the new accounting machine, we handle both accounting and payroll operations on the one machine. All manual recapping has been eliminated. Trial balances are now done faster and more easily.

By summarizing the detail cards each month, and creating a new year to date summary card monthly, these summary cards can be merged with the current next month detail cards to produce a report showing a monthly detail and new year to date figure by account. The year to date figure represents the new balance for each account and takes the place of posting to the old ledger card.

In this system, a clear definition of each charge by office, division, department, or account is more easily attainable. In addition, this system updates delivery of reports to management. There are, of course, other advantages to this type of system that can not be equated in terms of dollars and cents.

(continued on next page)

1. Accounts payable checks are written daily and distributions are made to the various accounts. Also, at the end of each month the monthly entries are put on the books with a simplified special program bar.
2. Tape is fed into the converter to produce detail cards for each distribution entry.
3. Detail entry cards.
4. Detail cards are tabulated by page number for control purposes.
5. Reports by page number showing total of each page for control back to journal page hard copy written on NCR 3100 machine.
6. End of month all detail cards are sorted by vendor number.
7. Vendor name match punched into detail cards.
8. Cards sorted by account number in preparation for trial balance.
9. Trial balance by account number and divisions.
10. Adjustments and corrections are made.
11. Account header cards, year to date ledger cards from last month, and current month detail cards are merged together.
    1. Account header cards.
    2. Year to date ledger cards.
    3. Current month detail cards.
12. The cards are summarized and tabulated.
13. Monthly Profit and Loss statements and Balance Sheets are produced, with current and year to date figures shown on the reports.
14. New year to date summary card produced for next month. ■



Orthotronic Control

An automatic error detection—correction system.

ELECTRONIC DATA PROCESSING has become a permanent part of American economic life. The electronic computers are rapidly taking over a very substantial portion of the data processing and record keeping functions in business, industry, government and the military establishment. The day is close when electronic data processing will be the custodian of much of the vital information that keeps our economy on the move.

Under these circumstances it is natural that reliability and the related issues of error detection and correction have assumed a position of the utmost importance in the minds of manufacturers and users of electronic data processing systems.

Many important technological improvements are being incorporated in the new electronic data processing systems to greatly increase reliability. The increasing speeds at which the present-day systems work, however, together with the corresponding increase in work loads, not only make it mandatory that the level of reliability be high, but also that the means be incorporated in the machines to efficiently detect and correct errors when they do occur.

Automatic error detection is the prerequisite of any automatic error correction system. Manufacturers of electronic data processing systems have developed a number of automatic detection techniques. Certain of these are based on maneuvers in the area of machine programming. This method is especially suited to data processing involving a great deal of mathematical computation, where various types of formulas can be brought to bear to detect inconsistencies in the results obtained in the computations. The correction technique generally employed here is to re-run a portion or all of

By Owen M. Rye

the program in which the errors are suspected to have occurred.

A second technique involves a redundancy of equipment specifically arranged to yield immediate error detection. Although this technique has been used, its applicability in the advanced computers is limited because of the cost of the additional equipment.

Redundancy of information

The detection technique most frequently used involves a redundancy of information. This redundancy, in various applications, ranges from complete duplication of information to simple parity checks of long trains of information. Nearly all electronic data processing systems in use today use the redundancy concept in one form or another.

The power of these redundancy checks has usually been evaluated on a theoretical mathematical basis. That is to say, it has generally been assumed that the frequency distribution of error patterns is based on independent and equal probabilities of single digit errors. This premise was not unreasonable in the absence of evidence to the contrary. However, sufficient operating data on various systems has been assembled to indicate that this assumption is unwarranted.

A new approach is now being taken by electronic data processing system manufacturers to the design of error detection and correction systems. The new concept, in effect, states that the equipment itself is best able to define its own idiosyncracies in respect to error behavior. Through laboratory observation of actual data processing networks it is possible to build up a sizeable array of statistics on error behavior. These statistics in turn enable the system designer to formulate a very powerful detection technique tailored to particular specific equipment.

Error correction

There are two broad classes of error correction. The first, or "reversion" class, consists essentially of re-executing the operation immediately upon detection of an error. This class of correction includes all forms of program re-running, and in general requires that information in its correct form be retrieved from some previous point in the operation.

The second class of error correction—"deductive" correction—involves a powerful detection scheme capable of isolating the actual elements of information which are in error, correcting these elements, and proceeding with the program. Under this system it is not necessary to revert to a previous point in the program.

The outstanding example of an error detection and correction system, utilizing the new concept of error detection discussed above and the "deductive" approach to correction, is incorporated in the new Honeywell electronic data processing systems — both the Honeywell 800 and the Honeywell 400.

This system, known as Orthotronic Control, utilizes a strong two-dimensional detection technique. The technique assumes that information is transmitted in parallel channels from memory, enters in intermediate buffer storage stage, and is then recorded on magnetic tape in a multiplicity of channels. At a later time, this tape is read and the information again is transmitted through parallel channels to an input buffer storage and thence back to memory.

The orthotronic correction system is designed to retrieve automatically any information which has been lost in the course of the full transmission cycle from the time the information leaves memory to the time it is returned to memory. The transcription to and from magnetic tape will have occurred in the course of the cycle.

No human intervention

Orthotronic Control, in effect, is a system of error control, using the newest technological approaches, that detects and corrects mistakes occurring in magnetic tape operations.

Orthotronic Control accomplishes this automatically without the manual intervention and lost

(continued on next page)

Coming Events

MAY 21 - 25

Municipal Finance Officers Association 55th Annual Conference
The Olympic Hotel, Seattle, Washington

MAY 22 - 25

Symposium on Computer System Large Capacity Memory Techniques sponsored by Information Systems Branch, Office of Naval Research
Department of Interior Auditorium, Washington, D. C.

MAY 25 - 26

Operations Research Society of America 9th Annual Meeting
Sheraton-Blackstone Hotel, Chicago, Ill.
Contact: Dr. Donald H. Schiller, 205 N. Wabash Ave., Chicago 1, Ill.

MAY 31 - JUNE 3

GUIDE — IBM 702, 705, 7070 and 7080 Users' Conference
Queen Elizabeth Hotel, Montreal, Canada

JUNE 4 - 7

National Association of Purchasing Agents Convention
Conrad Hilton Hotel, Chicago, Ill.

JUNE 6 - 8

ISA Summer Instrumentation-Automation Conference and Exhibit
Royal York and Queen Elizabeth Hotels, Toronto, Canada
Contact: William H. Kushnick, Exec. Dir., ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

JUNE 7 - 9

Armed Forces Communications and Electronics Association Annual Convention
Shoreham and Sheraton-Park Hotels, Washington, D. C.

JUNE 18 - 23

Business Management Institute, Electronic Representative Association
University of Illinois Campus, Champaign, Ill.

JUNE 26 - 28

IRE Fifth National Convention on Military Electronics.
Shoreham Hotel, Washington, D. C.
Contact: Mr. Harry Davis, SAFRD, Pentagon, Washington 25, D. C.

JUNE 28 - 30

NMAA Annual Conference
Royal York Hotel, Toronto, Canada.
Contact: Mr. R. Calvin Elliott, Exec. Dir. NMAA, 1750 W. Central Road, Mt. Prospect, Ill.

JULY 9 - 14

ISA and IRE 4th International Conference on Bio-Medical Electronics and 14th Conference on Electronic Technology in Medicine and Biology.
Waldorf-Astoria Hotel, New York, N. Y.
Contact: Dr. R. L. Bowman, ISA, Dept. of Health, Education and Welfare, National Institutes of Health, Bethesda 14, Md. or Dr. Herman P. Schwan, IRE, Univ. of Pa. School of Elect. Eng., Philadelphia, Pa.

JULY 18 - 20

Western Plant Maintenance and Engineering Show and Conference
Pan Pacific Auditorium, Los Angeles, Calif.
Contact: R. L. Saling, Ch. Bd. of Sponsors, c/o Clapp & Poliak, 759 Monadnock Bldg., San Francisco 5, Calif.

computer time so frequently associated with ordinary re-start or re-run procedures. In such procedures the problem of re-start and re-run becomes most serious when the record in error was properly recorded during a previous run, but now is incapable of being read. It is to this type of error, the most costly in time and effort, that Orthotronic Control is applied most advantageously in the Honeywell electronic data processing systems.

The basic principle of orthotronics may be compared to the accountant's practice of crossfooting. In crossfooting, a zero balance of rows and columns is obtained to insure accuracy. If a zero balance is not obtained, the crossfooting technique has accomplished its single function of error detection. Orthotronic Control performs this function and goes on to automatically correct the error.

When computers record data on magnetic tape they use computer language, a binary code. There are many binary codes. The familiar Morse Code is one and the Telegraph Code is another. In such codes, the numerical and alphabetical symbols, used by humans, are replaced by specific arrangements of dots and dashes or, more usually, dots and non-dots. If, accidentally, a recorded dot is played back as a non-dot or a non-dot as a dot, then an error has occurred.

Although modern magnetic tape handling mechanisms used with electronic computers are extremely reliable, they are sometimes subject to introduction of errors into the data being recorded or played back. These errors are not caused by the tape units or other computer components, but rather by extraneous sources, such as minute flaws in the coating of the tape itself, or by the transient presence of dust, hair, or lint. Such particles may be carried under the magnetic head and, by separating the tape from the head, cause errors.

Transverse parity check

All modern magnetic tape systems include what is called a *transverse parity check* which detects the occurrence of errors and stops the progress of the computer program. The work of locating the error and of making the necessary correction is usually left to the computer operator.

With Orthotronic Control, however, errors are detected and then corrected by a powerful two dimensional monitoring arrangement (*Orthowords in the longitudinal direction; parity in the transverse direction*). Correction occurs automatically under a special program called the Orthotronic Routine permanently stored in the memory. The time taken to correct an error averages about five thousandths of a second, after which control is transferred back to the original program which proceeds as though nothing had happened.

So powerful is Orthotronic Control that it will

reproduce a record correctly even if a channel fails to record, or play back, throughout the record. Although errors rarely affect more than one channel at a time, Orthotronic Control will also correct cross channel errors: for instance, if a hair lying across the tape causes all channels to lose contact with the head, briefly, the Orthotronic Routine will correctly reproduce the lost data.

Continuous tape check

Orthotronic corrections take place too quickly to be noticeable. However, they can be automatically counted and the number printed out at the conclusion of each tape run. Such a procedure provides a continuous check on the condition of the tape. Frequent corrections might indicate that a tape is in poor condition or that the storage and handling environment is dusty.

If data containing numerous errors is transferred under Orthotronic Control from an unsatisfactory tape onto a new tape, the errors are all corrected. Such a process can be compared, in its level of sophistication, with the work of an accountant.

But how many accountants can locate and correct an error in five thousandths of a second? How many could find and rectify the errors in a file of 100,000 items, each of 150 numerical and alphabetical characters, in approximately five minutes? The Honeywell electronic computers can. What is more, they do it automatically each time the file is up-dated. ■

AUTHORS

(continued from page 4)

Link is active in the local chapter of N.M.A.A. and is on the board of directors of the local chapter of the Society for the Advancement of Management.

OWEN M. RYE (*Orthotronic Control*) is Engineering Administrator for the Electronic Data Processing Division of Minneapolis-Honeywell. Previous positions during his 10 years at Honeywell were with the Aeronautical and EDP Divisions in Quality Control and Quality Engineering. Mr. Rye's academic background includes B.Ch.E., University of Minnesota, followed by wartime service in the Navy (electronics) and return for graduate study and Instructorship (four years) in mathematics and mechanics at the University of Minnesota.

EDWARD WEBSTER (*Computer Control*) graduated Phi Beta Kappa with a degree in liberal arts from Gettysburg College, Pennsylvania. After a stint in Germany with the U.S. Army and a year of free-lance writing and travel abroad, Mr. Webster entered the systems field with the Raytheon Company as a member of a "mechanization task force" engaged in an intensive analysis program throughout all plants of the Government Equipment Division. Joining Sylvania Data Systems Operations, he developed a number of EAM systems before going on to programming and administrative systems planning for the Computer Operations Department. ■

Marien on FORMS —A Monthly Feature

Who Should Buy Forms?

RAY MARIEN

IN MANY COMPANIES the forms buying activity is limited strictly to the purchasing department. A logical enough choice. However, in others, forms buying is done *outside* the purchasing department by such individuals as the data processing supervisor, the forms control supervisor, the head of accounts payable, the office manager and others.

Each of them can make a case for their side, if you ask them for one. Boiled down, the office manager and accounting chief have the weakest arguments, because theirs is not based on technical knowledge. Usually they buy the forms because they are intended for use within their departments, and their strongest point is that they get quicker service. They don't mind asking purchasing to rubber stamp their orders with a confirming purchase, but they don't like the red tape prior to the issuance of such an order. Unfortunately the red tape they dislike happens to be such *inconsequential* paperwork as requests for quotations and bid tabulations! Very essential to any professionally handled purchase!

They don't *mind* interviewing salesmen. It sort of breaks up the day for them. In fact, they mind even less when the salesmen take them to lunch. That sort of breaks up the *afternoon*. But they do little to formalize the liaison, or handle their purchases in a manner that good business practice dictates.

On the other hand, both the data processing manager and the forms control supervisor have *one* strong argument going for *them* — they know all about the form, how it should be designed, what kind of carbons are needed, and what sort of results are expected from its use. They *know* all these things and it's tough to argue them down because in many instances the forms are being used on electronic equipment that rents for thousands of dollars. If anything goes wrong with the forms —the blame falls heavily upon their shoulders. The machines stand idle while they try to straighten out the situation. So they have grounds for *wanting* to handle the forms procurement personally.

The data processing manager's argument, however strong, can still be bypassed. Simply because his function does not encompass the design of forms, let alone buying them. He may know, or think he knows, all about the machine requirements for horizontal and vertical spacing, and certain tricks of the trade that can be built into the design for more efficient use, but he doesn't *really* know all there is to know about forms design and paper specifications. So actually, this leads us up to the man who should be conversant with all those factors, the *forms analyst*. And it leaves the data processing manager back with his own problems, specifically, how to get the "mostest" out of his machines in the "fastest" way. That *is* a full time job and he should be perfectly happy to leave the forms designing to the man whose job that is!

The forms analyst

The forms analyst should know more about forms design, paper and carbon stocks and forms printing processes than anyone else in the company. This would seem to give him an iron-clad argument for buying the forms. In some companies, it's convincing enough so that they actually turn over blocks of purchase orders to him and, in effect, make him an authorized buyer. The only thing commendable about such a practice is that purchasing doesn't have to rubber stamp the orders. The bad thing about it is that they've relinquished one of their functions and actually sanctioned that kind of buying.

Knowing all there is to know about a material item does not make a man a purchasing agent. It makes him an *authority*, but it still does not make him one on *buying*. Buying is a field unto itself. It takes years of training to make a good buyer. It may also take quite a while to develop a good forms buyer—but it *is* a job apart from forms control. It's like buying most other commodities. If the purchasing agent is given complete specifications for the item, and knows his sources, he can handle the job perfectly from that point. Does the plant engineer buy machinery because *he* understands exactly what he wants *better* than anyone *else*? Of course not! He prepares complete specifications and turns them over to a qualified purchasing department buyer. Then he goes about his job. It may take weeks to investigate and negotiate such a purchase. Meanwhile he's doing his regular job and leaving the details up to purchasing. He can expect to be called on from time to time when certain technical questions arise, but other than that, it's purchasing's job to place the order.

The exact same situation should prevail in forms buying. The data processing and forms control supervisors should furnish all the details and let it go at that. They too can expect to be called on later. Perhaps they'll also need to talk to the vendors, but the mechanics of purchase belong only in the purchasing department. For better management control, they should stay there.

In recent months, some professional purchasers associations have raised a clamor for purchasing to have more stature in their companies. It seems to me that this "stature" would come naturally if they stopped down-grading their own abilities by *relinquishing* part of their jobs to other departments, as so often happens with the forms buying. ■


T.A.B
THE
TAB
PRODUCTS CO.
CARD
FILE
GIVES
TOP
QUALITY
BEAUTY
FUNCTION
VISIBILITY
AND
VALUE

The Lawyers Look at EDP

THE LAWYERS of this country are starting to assess their role in an EDP-oriented society. Alerted to the fact that the new technology is changing many familiar practices in business and industry in connection with which legal questions arise, the lawyers realize the importance of learning promptly about the nature of the changes and of their legal implications.

The first step in the program to bring lawyers up to date on computers was a three day Forum on the Legal Problems in the Use of Computers in Business, Industry, and Law in Washington, D.C., March 23-25, 1961. It was sponsored by the Joint Committee on Continuing Legal Education of the American Law Institute and the American Bar Association, the educational arm of the national organized bar.

General Chairman of the sessions was Roy N. Freed, a Philadelphia lawyer whose pioneering article entitled, "A Lawyer's Guide through the Computer Maze," which appeared in the November 1960 issue of The Practical Lawyer, inspired the Forum and blueprinted the discussions.

It was the general consensus that our legal rules are framed broadly enough to accommodate the changes wrought by the new electronic information processing technology. But to achieve a smooth transition, it was stressed that lawyers and judges must become acquainted with the workings of that technology at the very earliest moment. The readiness of lawyers to secure that knowledge was apparent from their receptivity to the entire day of the sessions devoted to a description of computer mechanisms and their uses and to how computer consultants can help lawyers with technical complications.

EDP practitioners will be interested to hear that lawyers now will be looking over their shoulders to see how accounting records are being altered, how management activities are being mechanized, and how automatic controls are being utilized. The lawyers must know these things in order to prepare and try their legal cases. They must know about the new records so that they can use them in evidence. Familiarity with machine decision-making practices of all sorts is essential to them in evaluating legal liability in case of harm producing errors.

At the Forum, the new technological environment was described by Ezra Glaser of the National Bureau of Standards, Wayne D. Bartlett of General Electric's Defense Systems Department told how computers work, and Arnold I. Dumey of Data Sciences, Inc. pointed out how computer consultants can help lawyers. Morton J. Rossman of Peat, Marwick, Mitchell & Co. looked at EDP developments through the eyes of an auditor and told of new auditing control techniques utilized in computer accounting systems.

The lawyers who prognosticated the legal problems in store included John R. McConnell of Philadelphia's Morgan, Lewis & Bockius, who talked on the rules of evidence; Wilfred R. Lorry, of Freedman, Landy & Lorry, also of Philadelphia, who explored tort law or negligence matters; Carl W. Funk, of Philadelphia's Drinker, Biddle & Reath, a specialist on banking law; Francis G. Awalt, Jr., of IBM's New York legal staff, who took the corporate counsel's viewpoint; Lipman Redman, of Washington's Guggenheimer, Untermyer & Goodrich, a tax lawyer; and Bartholomew Diggins, of Diggins & LeBlanc of Washington, who spoke about patent, antitrust, and copyright matters. Bertrand M. Harding, Assistant Commissioner of Internal Revenue, gave a detailed preview of the EDP systems planned for processing Federal income tax returns.

Lawyers were informed by Mr. Freed of the variety of improved information processing systems, of a simple mechanical nature as well as electronic, available to help them achieve greater efficiency and lower costs in their own professional work. He recommended that lawyers take an engineering systems approach in exploring ways to better their operations. Since efforts are in process to develop major information storage and retrieval systems to assist in legal research, he urged that the organized bar establish an authoritative group right now to formulate goals and standards for an ideal set up of that sort. He particularly recommended a single index or finding system, if possible, to avoid the burdens of the present multiplicity of indices and to permit integration of as wide a variety of legal materials as possible in a single retrieval system.

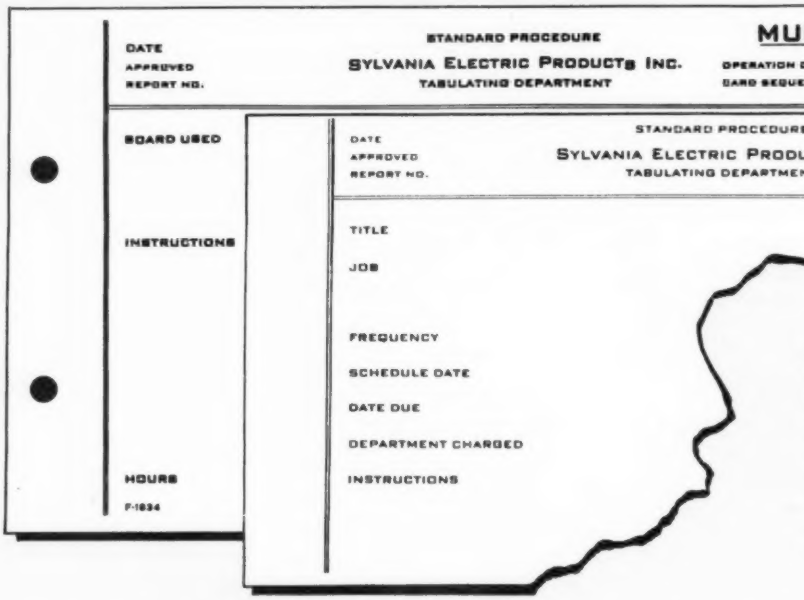
The audience of the Forum came from the entire country and included not only lawyers from law firms, corporate staffs, and the government, but also non-legal representatives of banks, insurance companies, a wide variety of manufacturing concerns, accounting firms, transportation companies, publishers, and management consultants.

Because of the enthusiastic response and specific requests of the registrants, the Joint Committee plans to hold additional forums in other cities in the near future. *Data Processing* will carry notices of these events as soon as they are announced.

■ ■ ■

Punched Card Ideas

BILL KLUMPP



DATE
APPROVED
REPORT NO.
STANDARD PROCEDURE
SYLVANIA ELECTRIC PRODUCTS INC.
TABULATING DEPARTMENT
MULTIPLIER
OPERATION CODE
CARD SEQUENCE
BOARD USED
INSTRUCTIONS
HOURS
F-1834

DATE
APPROVED
REPORT NO.
STANDARD PROCEDURE
SYLVANIA ELECTRIC PRODUCTS INC.
TABULATING DEPARTMENT
TITLE
TITLE
JOB
FREQUENCY
SCHEDULE DATE
DATE DUE
DEPARTMENT CHARGED
INSTRUCTIONS

The two forms shown are sample pages from compact manuals developed by:

The Tabulating Department
Sylvania Electric Products, Inc.
Emporia, Pennsylvania

Manuals with these pages are approximately half the size of standard 8½" x 11" manuals. There is provision for the necessary information on each page.

The title page names the report under the items of title and job. Frequency, schedule, date, date due, department charged and instructions complete the page. Each title page is followed by the machine page in the procedure sequence. The sample of the multiplier (*calculator*) page contains the operation code, card sequence, the board (*control panel*) used, instructions and hours. If the next operation involves the tabulator (*accounting machine*), there is a similar page for it.

Compact manuals can be carried from machine to machine and placed on the machine near at hand for reference. The essential details of the procedure are recorded in the manual. After a skilled operator has learned the procedure of the report, he has memorized card forms and their location in the card files. A small manual can be carried in a card file drawer from machine to machine.

This idea was sent to us by:

Anthony J. Zito, Jr.
Tabulating Supervisor
Data Processing Center
Sylvania Electric Products, Inc.
Camillus, New York

Tub files

Tub files are best used in inventory applications where the number of items is 2000 or less. If, for instance, the merchandise is hardware, such as hammers, pliers and wrenches, one card in the tube file is used for each tool. If there are 50 hammers on hand, each hammer is represented by a punched card in the file. In this card are usually punched the following: item code, description, price and other necessary information.

The tub file method can be used for invoicing (billing), sales analysis and inventory. A card count, entered into a counter of the accounting machine, provides the quantity. Price is accumulated in another counter. There is no need for an extension of the card on a calculator.

Master card insertion device

When the number of items in an inventory reaches 50,000 to 60,000, the tub file can be replaced by master cards in a card file. A standard card file will accommodate approximately 60,000 cards. In each card there is a quantity field and a price field. The master card insertion device on the key punch provides for the punching of the quantity and other variable information. The remainder of the information such as item code and description can be duplicated from the master card. The master card is replaced in the file. The duplicated card is extended on the calculator and used for invoicing, sales analysis, inventory and other reports. These cards can be discarded after the reports have been run.

A key punch with a master card insertion device looks like a standard key punch. All the circuitry is internal. The only changes on the keyboard are a switch and a functional key. The key punch can be ordered with the device. If the master card insertion device is installed in the field, at least a day is required. There is small additional rental for the device if the machine is leased. ■

By Norman Bush

Questionnaire Analysis by UNIVAC

University of North Carolina Computation Center analyzes social problems.

MOST QUESTIONNAIRE STUDIES are generated in order to fulfill a need for learning about some social structure, public opinion, city planning, consumer preference, or anything else which may reflect customs, habits, likes, dislikes, and all sorts of factual and subjective material. The individual or group who plans and organizes the questionnaire study is eventually faced with the problem of tabulating and analyzing the data.

Instead of using the standard punched card equipment for assisting in the analysis of questionnaire data we are proposing the use of a general purpose digital computer. At the University of North Carolina Computation Center the technique of using a digital computer, the Univac 1105, for questionnaire analysis has been in successful operation since July, 1960.

To date there have been two major users of the questionnaire analysis program, and it is estimated that over two thousand two-way tables (*with complete statistical calculations*) have been generated for these users. One is a marriage counselling study which surveyed over 500 North Carolina physicians, asking each physician pertinent questions on their current marriage counselling procedures. This study was conducted by Mrs. Ethel M. Nash of the Bowman Gray School of Medicine. Another research study in executive leadership was conducted under the direction of Professor E. William Noland of the Department of Sociology of the University of North Carolina.

One of the tools of analysis might be contingency tables, where we look at the interesting two-way relationships such as level of income and consumer preference, or (*with respect to physicians*) medical school attended, and viewpoint on different medical subjects. Other statistical techniques may include regression analysis, and analysis of variance. However, since most of the data collected in a questionnaire is qualitative rather than quantitative, the two-way table analysis or contingency table analysis is usually performed.

Usually synonymous with the tabulation and statistical calculation of contingency tables are such types of equipment as:

1. Key punch — to put useful data on cards.
2. Sorter — to make one or two-way tables.
3. Tabulator — to print results.
4. Desk calculator — to perform calculations on data.

Although this is not a comprehensive list of equipment, it does represent typical equipment used in analyzing data from a questionnaire.

Computer advantages

Now, in contrast to the generally accepted procedure outlined above, we would like to replace items 2, 3, and 4 with a general purpose electronic digital computer. Thus, after the information is put on cards, we would then rely on a digital computer to perform the remaining work.

The main reasons the computer is used in lieu of standard punched card equipment are:

1. Accuracy.
2. Speed.
3. Flexibility.

Once a spot check is made on a series of calculations it is very reasonable to assume that all calculations are correct. This eliminates any need for double checking. As for speed, it is not unusual to obtain anywhere from 100 to 200 contingency tables (with all pertinent statistical calculations) per hour of computer time, after the cards are punched. This also can be increased by additional programming techniques.

The most valuable extra asset in the operation is the computer's flexibility to accept program changes easily in order to generate special tables or do additional calculations. This last category is very difficult to evaluate in terms of how much it may contribute to the study, but as any computer programmer knows, it is very easy to put small modifications in a program for temporary or permanent use.

There is one very important advantage in the use of the computer which should receive special attention, i.e., as far as the computer is concerned there is no small restriction on the number of questions we have in the computer simultaneously, nor on the number of codes we use for each question. In a sense, we are saying that you could have a punched card with, say, 20 rows instead of 12, and 200 to 300 columns instead of 80, (*with, of course, special punched card equivalent to handle these extra-ordinarily large cards*). The computer has no physical restrictions (*the way cards do*), except for the size of its memory, so we do not have to limit ourselves to single one digit codes, or tabulating only those tables for questions that appear on the same card.

For example, if we had a questionnaire with 150 pertinent questions and some of the questions needed 15 codes, then we would assign all numeric codes 1, 2, 3, . . . 13, 14, 15, instead of using numeric and alphabetical symbols for those questions, and then place the information from *one* questionnaire on as many 80 column cards as necessary. Thus, each questionnaire may be represented by three cards. If we had 1000 questionnaires in the study, we would have to prepare 3000 cards for the entire study. Now, using the computer concept, we could put all the information from the 80 column cards onto magnetic tape and use the magnetic tape as input to the computer. This also provides a permanent record of the data.

For 150 questions, there would be a possible 11,175 two-way tables and although all of these tables are not needed or even useful, it is possible during any computer run to obtain any one of these 11,175 tables. If you want a two-way table between questions 1 and 150, using conventional punched card equipment, the use of a reproducer would be necessary to place the information of questions 1 and 150 on the same card. But the computer has no such restriction and information from the same questionnaire on consecutive cards can be fed into the computer and be referenced or used at any time. As was mentioned before the only serious limitation the computer has is its memory size and computer memories are becoming larger and larger each year.

Currently there are three questionnaire analysis computer programs available at the UNC Computation Center. The programs tabulate and compute a two-way table analysis of questionnaire data and a printed output of the following comes with each table:

1. Identification of the two questions.
2. Counts for each cell in the table.
3. Percentages by rows in the table.
4. Individual cell contributions. (*These would add up to the total chi square*)
5. Total chi square.
6. Marginal values in table.

Depending on the particular program the computer generates 18 to 40 tables during *one* reading of the data (*on the magnetic tape*), then rereads the data for the next 18 to 40 tables. This is continued until all the desired tables are computed. The output information is put on a magnetic tape and then printed off line, i.e., we use a printer which is independent of the computer.

The only input additional to the questionnaire cards that is required is the identification of the questions that make up each table. This is put into the computer from cards. The number of tables generated in a machine run depends on the following three factors:

1. Number of questions for one questionnaire.
2. Number of questionnaires.
3. Maximum size of table to be generated.

The table below illustrates the running time based on some maximum values for (1) and (2) above and some nominal values for (3) above.

CURRENT MAXIMUM CAPABILITY OF PROGRAM			
Number of Questionnaires	Number of Questions for a Single Run	Tables Per Hour for 10 x 10	5 x 8
500	152	100	240
1000	152	70	170
1500	152	50	120
2000	152	40	100
3000	100	40	100
4000	75	40	100
5000	60	40	100

Now, generally speaking, fewer questionnaires, or fewer questions per questionnaire, mean more tables per hour, while a larger table means fewer tables per hour.

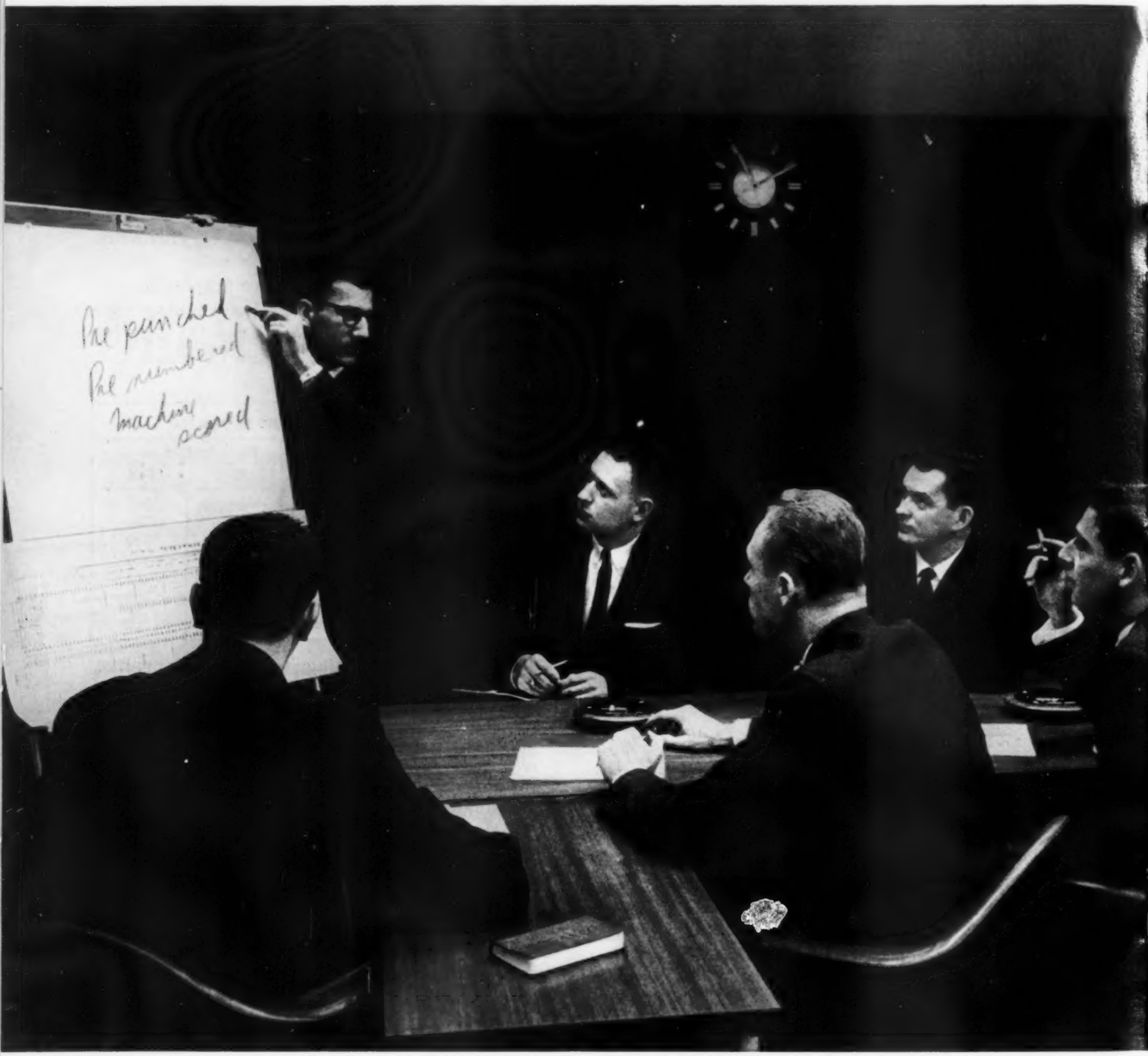
In the currently existing programs the restrictions are:

1. Maximum of 5000 questionnaires.
2. Maximum of 152 questions in a single run.
3. Maximum of 10 x 10 tables generated.

Items (2) and (3) above are very arbitrary and can be changed easily in order to accommodate more questions or generate larger than 10 x 10 tables.

Finally, we would say that the utilization of a digital computer in the capacity described in this article is only a first step towards developing faster, more efficient, and more powerful data processing techniques. Sometimes in order to take advantage of, or use, a more realistic or better mathematical model in describing some physical situation, we need to be sure that we have some reasonable way to calculate and evaluate it. In this sense, it is with respect to increasing the scope of the analysis of data that the digital computer really pays off. ■

How this new team of IBM Supplies



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PROMPT SERVICE—IBM offers you same-day delivery on control panels and magnetic tapes, to meet emergency needs. In addition, through its nation-wide manufacturing and warehousing facilities, IBM can service *promptly* the card needs of any customer in America.

TECHNICAL ASSISTANCE—Through its network of Card Design Centers, IBM can assist you in developing card designs that will improve card handling techniques, reduce card consumption, and contribute to the economy of your data processing operations. As for control panels, your IBM specialist can help you profit from the ideas and experiences of others who have solved problems similar to your own.

PRODUCT QUALITY—IBM supplies are made to precise specifications which have been developed over more than 40 years of research, testing and performance analysis.

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DeParis on EQUIPMENT —A Monthly Feature

Punched Card Equipment Revitalized

JOSEPH R. DE-PARIS

THE CONVENTIONAL PUNCHED CARD, reigning monarch of data processing throughout the electro-mechanical period, tumbled from its lofty perch with the advent of the electronic era. Many prophecies have been made that this decline would become a demise — but such is not the case, neither now nor in the foreseeable future.

Punched cards continue to play an important and vigorous role in data processing. So called EAM equipment may have declined as a percentage of all equipment, but in absolute numbers they seem abundant as ever. Manufacturers and engineers appear confident of the bullish future of punched card equipment. Some enterprising groups have been at work developing attachments for conventional punched card machines which expand their capacities and enhance their flexibility. Others have developed devices for punching cards in remote locations, table model tabulations for low volume balancing, coupling arrangements for combining punching and balancing. Provocative systems possibilities become possible.

An extremely interesting attachment is one which combines a magnetic drum memory with IBM tabulators, collators, reproducers, etc. Here is an exposition of this device:

HRB-Singer, Inc., a subsidiary of the Singer Manufacturing Company, is producing a new type of electronic computer with an interesting simplified mode of operation. Called SEMA (the letters stand for Singer Electronic Memory Attachment), it attaches to any IBM tabulator, reproducer, collator, etc., to extend their capabilities. Small "piggy-back" plugboards are furnished for permanent or temporary attachment to various IBM machine panels, and the connecting cable of the SEMA plugs into these panels. The SEMA itself is built into a handsome little waist-high cabinet which rolls on wheels wherever it is needed.

SEMA contains an electronic counter and from one to five magnetic storage drums, each drum holding 2000 words, and each word consisting of ten digits and two flags. A switch converts this to 4000 words per drum with five digits and one flag per word. The digit portion of any word can store plus or minus numbers and the flags can be set to store yes-or-no information. Flags, among other things, can be used to control selectors, to print out a signal, to control summary punching, and to stop read out at preestablished addresses. Numbers can be entered from cards or counters in the IBM machine into any word on the drum, at the rate of one word per machine cycle. Numbers on the drum can be read out to the IBM machine, or updated by amounts from the IBM machine, at the same rate. A number may be read from the drum and simultaneously multiplied by any single digit, and the product transmitted to the IBM machine, in one machine cycle. Multiplication by more than one digit takes extra cycles. The switch which splits each ten-digit word into two fives also splits the counter so that different operations may be performed simultaneously in the right and left portions.

SEMA does not have a stored program but gets its instructions through the wiring of the little plugboard mentioned before. This board contains counter entries and exits, counter controls, address entries and exits to identify words, flag entries, and selectors which indicate minus amounts, zero amounts, and the presence of flags. Wiring the panel is similar to wiring an IBM tabulator.

The SEMA with one drum is quoted at $20,000 for sale or $532 a month rental. Additional drums cost $5000 each or $125 a month.

SEMA application

What follows is an example of SEMA in use. A careful reading will open a Pandora's Box of ideas for you. A billing, accounts receivable and inventory application might use the SEMA as follows; however many variations are possible. Some of the drum addresses would in this case be assigned to product numbers, some to customer account numbers, and some to salesmen's numbers. SEMA would be used at various times with a 402-3 tabulator, with a reproducer, and with a collator.

1. Reset the drum(s) of SEMA, plug SEMA into collator, and load yesterday's closing inventories by passing a deck of cards through the primary feed.
2. Plug SEMA to the 403 and run invoices in a normal manner. SEMA will simultaneously do the following:
   - **A.** Update inventory quantities by product on the drum.
   - **B.** If any item ordered would reduce inventory below zero SEMA will change the transaction from sale to back order, causing the 403 to print a symbol meaning back order and to non-add the amount.
   - **C.** Accumulate back order quantities by product.
   - **D.** Accumulate dollar amount by customer.
   - **E.** Accumulate dollar amount by salesman.
3. Next plug SEMA into reproducer and punch out total back order quantities by product. Pull detail cards for back ordered items from billing deck (*manually*) and balance to these total cards.
4. Attach SEMA to collator and subtract-load minimum quantity cards by product. Write flag in those that turn minus. Then restore closing inventory by add-loading the same mini-

(continued on page 38)

Computer Control

The difference between good and poor results.

FOR A COMPANY which overestimates the cost cutting potential of a computer installation, the electronic data processing road is one fraught with danger. In commercial applications the computer can perform billing and posting operations more quickly and accurately than humans, solve problems for research scientists which were insoluble before, and compile data so rapidly that management can detect trends and take corrective *anticipatory* action where it is needed. All this and more it will do — but it will normally *not* cut costs.

By Edward Webster

For this reason the savings realized through a computer application are tenuous. The dividing line between the machine which becomes a godsend to the company by placing it in a better competitive position and the computer which becomes nothing more than a devourer of profits is very slim indeed. The element which quite often determines which side of the line it will operate is *computer control.*

Control defined

Computer Control may be defined as the sum total of procedures and conventions concerning in any way the authorization for use, scheduling, actual operating, and recovery of costs in electronic data processing installation. Alternately it may be thought of as all activity directed toward achieving maximum production from the machine in the time available.

All too often computer control consists of voluminous but seldom heeded written directives and a heterogeneous collection of timeworn unwritten conventions adapted haphazardly as the need arose. It is important to realize that when embarking upon an electronic data processing program, fully as important as selecting the hardware, preliminary analysis and site preparation, is the design of a good computer control system.

Recently implemented at Sylvania Data Systems Operations in Needham, Massachusetts is an improved computer control system which is noteworthy for several reasons. Computer control is

not new, to be sure. So large an investment in any company is normally surrounded by a protective wall of logs, ledgers and procedures to govern usage and recover costs. However, at Sylvania these functions are performed smoothly and thoroughly with amazingly little clerical effort. Secondly, this successful performance is achieved in the face of greater problems of control than are normally encountered in most computer installations.

The Sylvania Needham operation places an emphasis upon the development of entire systems custom-tailored to specific applications. For this reason a large staff of programmers and analysts is maintained, usually more than fifty active on the machines during any given period. The variety of current projects, ranging from large real-time military programs, such as the Air Force BMEWS program, to development of utility packages or simulator runs for smaller special-purpose computers, means that computer runs seldom fall into any neat routine. Less than three per cent of the work is classed production, making long-range scheduling impractical. Three different computers are managed by the Computer Operations Section: Sylvania's rugged militarized mobile computer the MOBIDIC, an IBM 709, and the Sylvania 9400. Each of these machines must be scheduled independently because each is individual in its in-out media and peripheral configuration, its terminology, and its special scheduling considerations.

Still one more troublesome factor is that many contracts call for "co-op" programs which entail joint programming efforts by Sylvania and the customer, as well as on-the-job training for programmers, operators, and engineers. This means an accelerated turnover of personnel and often the necessity of inexperienced programmers and operators working with the machine.

In the face of the conditions described above, it became evident that stronger controls would be desirable. In June, 1960, the author was called upon to develop and implement an improved system to fulfill this need.

Hallmarks of good systems planning are fairly common knowledge. They include simplicity, utility, flexibility, control, economy and compatibility with existing data retrieval structures. Designed with these criteria in mind, the Sylvania system scores high in each and as a result was sold to management, implemented, and proven effective in less than three working months.

Guideposts

Several basic principles were set down as guideposts for planning. They are truisms, yet perhaps for that very reason are easily lost sight of in the pressure of day to day operations.

First, the computer is one of the largest elements of cost—for some companies that largest after direct labor and plant. As such it should be accorded proportional planning and control—more, for instance, than work-in-process on the shop floor.

Second, from the standpoint of devising operating procedures and programming conventions, the operator should be considered a part of the hardware: in function he may be thought of as a multi-purpose in-out device. As a rule, therefore, the less reading, writing, and thinking he must do, the better. Saving the operator time is saving machine time. (The preceding idea was not inserted with the idea of downgrading the job of operator. Systems consideration aside, there is no greater single contribution to an efficient computer installation than a well-seasoned operator with a thorough knowledge of his machine.)

Third, only production runs should be considered "good" time. Granted, many an article has been published, many a fervent oration delivered on how to classify computer time and the discussion still goes on. Yet in the final accounting it must be agreed that the computer "delivers the goods" only during the time it is engaged in production runs. Assembling, running of diagnostics, maintaining tapes—all of these from the standpoint of the company are no more productive than engineering maintenance. Considering a computer installation in isolation, "good" time might be defined in quite broad terms. The assumption in this case, however, is that the computer is an end in itself, rather than only the *means* to an end which it really is. This is an extremely important distinction, yet one often unacknowledged in a computer department.

Dispatcher

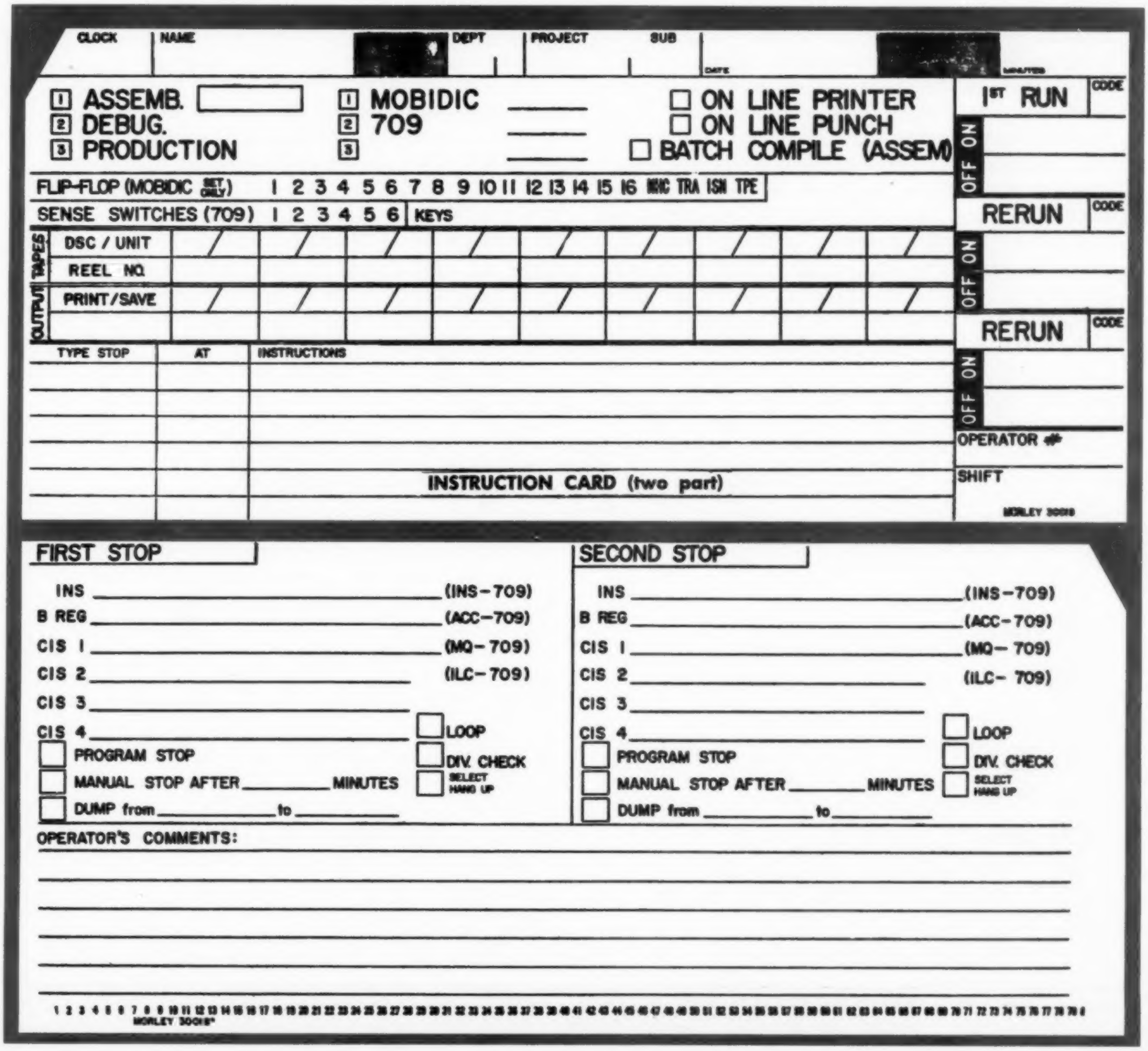
In the light of these three principles, the responsibilities for the position of dispatcher were outlined. This job description, once completed, formed the basic skeleton for the entire system. In general, the function of the dispatcher is to act as a buffer between programmers and Computer Operations. The following are his specific duties:

1. Based on weekly requests from programmers, to compile a schedule for computer time which will effect the best possible utilization of the machine and enforce that schedule within the changing parameter of engineering demands or last minute priority jobs.
2. To screen all incoming decks for lack of proper identification, obvious omissions such as remarks or transfer cards, or unauthorized charge numbers.
3. To ensure expeditious workflow in the computer area.

4. To act as the primary instrument of liaison between programmers and Computer Operations by telephone and through direct supervision of a courier whose main task is to deliver work for the computer and disseminate output.
5. To monitor the assignment of tapes, prevent unauthorized use of the assigned tapes, and take measures to minimize storage of "dead" tape.
6. To assist in the design and supervise the compilation and distribution of reports to specified recipients.

Viewing the scope of this job it may appear that a man of close to managerial calibre would be required to properly fill it. Essential is sufficient experience in both computer operation and computer programming to understand the problems and speak the language of both operators and programmers. Desirable is enough general business experience or academic business training to be conversant with management. Not so obvious, but more important than either of the above, is an aptitude in human relations. The delicate task of resolving the conflict of interest which inevitably arises in assigning limited computer time is one of his primary concerns.

In actual practice at Sylvania the dispatcher is able to perform these required tasks easily and thoroughly. As defined, his job does not necessarily require a man of near-managerial calibre. Generally, as any well-conceived system is further



CLOCK | NAME [redacted] DEPT | PROJECT | SUB | DATE [redacted] MINUTES

1 ASSEMB.
2 DEBUG.
3 PRODUCTION

1 MOBIDIC
2 709
3

ON LINE PRINTER
ON LINE PUNCH
BATCH COMPILE (ASSEM)

1ST RUN | CODE
OFF ON

FLIP-FLOP (MOBIDIC SET ONLY) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 MIC TRA ISN TPE

SENSE SWITCHES (709) 1 2 3 4 5 6 | KEYS

RERUN | CODE
OFF ON

OUTPUT TAPES: DSC / UNIT; REEL NO.; PRINT/SAVE

RERUN | CODE
OFF ON

TYPE STOP | AT | INSTRUCTIONS

INSTRUCTION CARD (two part)

OPERATOR #

SHIFT

MORLEY 3001B

FIRST STOP

INS (INS-709)
B REG (ACC-709)
CIS 1 (MQ-709)
CIS 2 (ILC-709)
CIS 3
CIS 4
LOOP
PROGRAM STOP
DIV. CHECK
MANUAL STOP AFTER ________ MINUTES
SELECT HANG UP
DUMP from ________ to ________

SECOND STOP

INS (INS-709)
B REG (ACC-709)
CIS 1 (MQ-709)
CIS 2 (ILC-709)
CIS 3
CIS 4
LOOP
PROGRAM STOP
DIV. CHECK
MANUAL STOP AFTER ________ MINUTES
SELECT HANG UP
DUMP from ________ to ________

OPERATOR'S COMMENTS:

MORLEY 3001B

unencumbered, clarified, and procedurized — in short, upgraded—the calibre of personnel operating within that system can be downgraded with no loss of efficiency. The control system at Sylvania, because it is as straightforward and self-operative as possible, in practice has borne out this theory.

Mainspring of system

At the heart of the system lies a key form, the "instruction and identification card". This two-part, keypunchable affair is initiated by the programmer and submitted with each run. It is a small item, yet performs four vital functions: it **1)** identifies the programmer and charge number; **2)** instructs the operator on running the program; **3)** provides for operator's comments to be returned to the programmer and **4)** keypunched, serves as input for almost any imaginable type of utilization analysis, management data, or programmer usage report.

When the console operator picks up a card deck to be run he removes the instruction card and immediately clocks it in by electric time recorder. During the run a two digit machine configuration code is entered and, should unexpected stops occur, they are recorded on the reverse side of the second part of the card. When the run is complete the card is clocked out and the second part separated and returned with the output to the programmer. It serves not only to identify and route the material, but also, displaying the operator's comments and clock stamped times on and off, it assists the programmer in debugging and shows him exactly how much time has been charged to him.

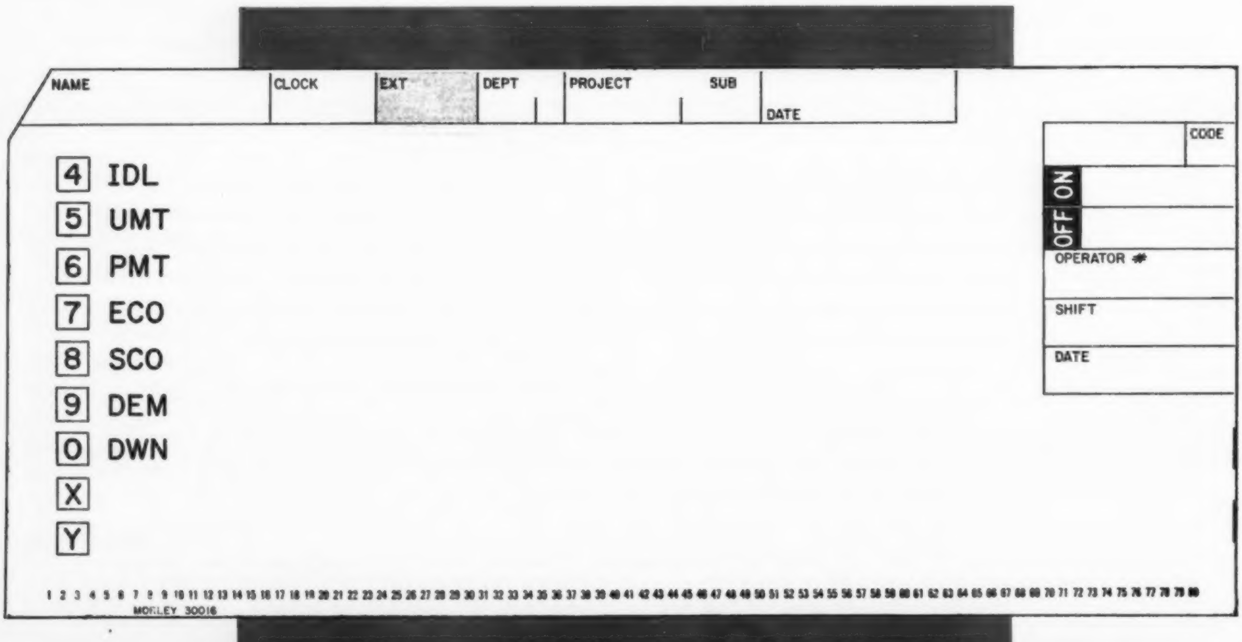
The original part of the instruction card is retained at the console. To the deck which builds up during the day "control cards" are added which account for all machine time not chargeable to programmers, such as idle or preventative maintenance time. Daily all cards are collected and keypunched, thereby becoming input for all reports.

Card log

Not the least of these reports is the daily log. Manual logging of machine usage at Sylvania has been dispensed with. Here was a task directly interfering with the operator's job at the console and duplicating an effort of the programmer as well. Yet the console log, because it serves as the primary source document for computer administration, is normally the most revered sacred cow in any installation, and as such, understandably difficult to abandon.

Since eliminating manual logging no difficulties have been experienced at Sylvania. The cards themselves serve as reference documents during the prime shift. Operators may enter any special remarks on them they feel necessary, and for activities other than running programs, account for the time by inserting special "remarks cards." The cards for the previous twenty-four hours are punched during the second shift so that at eight o'clock the following morning a neat printout of the log is waiting each supervisor concerned.

REMARKS CARD (one part)


NAME | CLOCK | EXT | DEPT | PROJECT | SUB | DATE

CODE

ON

OFF

OPERATOR #

SHIFT

DATE

4 IDL

5 UMT

6 PMT

7 ECO

8 SCO

9 DEM

0 DWN

X

Y

MORLEY 30016

Another frequently considered solution to the problem of "telling the story" is the electronic clock wired directly to an off-line printer. This setup can be programmed by means of a computer subroutine, the inclusion of special ID cards with all runs, and control panel wiring to produce useful reports automatically. In planning the Sylvania control system analysis revealed the present need was insufficient to warrant serious consideration of this alternative.

Utilization data

Weekly reports are distributed to supervisors of programming groups showing the computer time used by each programmer subtotaled by task. Analysis reports prepared for computer administration serve as tools for improving machine utilization and compiling machine reliability statistics for engineering. Time consumed by outside users is machine totaled. Monthly summary cards are punched to tabulate "to date" figures for each contract.

When pertinent, programmers must also submit off-line routing cards with each job. These cards follow the tape or card deck concerned until the specified off-line operation has been completed. In a case where a series of programs are generating output on the same tape, the cards accumulate at that tape unit until the reel is full. They are then placed in the container with the tape when it is routed to the off-line printer. Here they serve the off-line operator to double-check the identification of each file. They specify how many copies are required, the mode of space control, and how printouts should be labeled and distributed. In addition, time on and off for each job is recorded and the cards retained to serve as a machine log. Periodically these may be keypunched so that utilization statistics and charges can be tabulated.

Assignment of tapes to individual programmers is monitored by the dispatcher but actually carried out in the programming groups. In the machine area tapes are identified by number only. Each section is assigned a specific number series. By looking at the number only, therefore, the section assignment and location in the bins is immediately apparent to machine operators.

To effect the assignment of a new "save tape," a programmer need only ask the section clerk for a number. The clerk maintains a listing of the number series assigned to his section, and simply assigns the next available number. The tape itself need not be touched—it has been in the bin with the rest of the tapes for that section all the time. The dispatcher is notified of the change in assignment by the receipt of a tape assignment card originated by the clerk. He checks the card against his copy of the listing, updates the listing, and places the new card in his working card file, destroying the obsoleted card. As frequently as changes dictate, the new cards are punched, the entire file listed, and the updated listing sent to the appropriate sections. Only rarely is it necessary to physically change the number on the tape or its position in the storage bins.

The foregoing summary may create the impression that computer control has been effected simply by shifting the work load from the computer department to the programming departments. The generation of data associated with the operation of a computer has always been the responsibility of the user. Sylvania, instead of regenerating this basic data on the myriad forms often deemed necessary for efficient operation, has devised the means to transmit the original information through the entire cycle from request to report. Just two well designed cards can do the job. Efficiency through simplicity has been the underlying design concept. The complete system of computer control is accomplished with eight basic forms. By contrast, one large local firm is enmeshed in a control system requiring twenty-three forms.

In operation at Sylvania, the system has evoked an enthusiastic response from personnel in many areas. Programming supervisors now receive one more source of information to aid in judging programmer performance as well as automatically prepared computer costs for each contract; machine supervisors in Computer Operations find themselves not only with timely accurate utilization statistics, but with time on their hands to do something to further improve utilization; machine operators find their clerking operations practically eliminated and time to concentrate on speeding the work flow; and managment receives a valuable adjunct to its cost data program. ■

Correction Notice

The chart on page 21 of our April 1961 issue contains several minor errors. Our sincere apologies to our readers and to Mr. W. H. O'Keeffe, the author.

The following corrections should be noted:

With one exception, the Red coding should be shifted **two** columns to the right.

The Red coding in the last two columns on the right should be shifted **one** column to the right.

A reprint with a corrected chart is available to those interested.

The Editor

NEWS SUMMARY

FINANCIAL

Bendix Corporation reports net income of $7,632,537 for first quarter, $1.42 per common share including 60¢ non-recurring.

Burroughs Corporation's world wide revenue in 1960 was $389,210,550; net earnings were $9,235,867 or $1.39 a share. Up for the 11th straight year.

Control Data net sales for six months to end of 1960 were $8,543,126 with net income $403,722. Up over last year.

Electronic Associates earnings were up 14 percent in 1960, earnings of $1.27 a share for total of $918,000.

Friden's net sales rose to $89,244,715 for 1960, net profits were $5,800,622, a 49 per cent increase.

Litton Industries had a 40 per cent increase for six month period.

National Cash Register reports net earnings increased 5 per cent over previous year, earnings $2.52 a share.

Standard Register reported a six per cent increase in sales although net profits dropped for 1960.

Smith-Corona Marchant reported net earnings for last quarter of 1960 were $488,000 or 26¢ a share, with profits down.

Wilson Jones Co. reported net income of $103,000 or 31¢ a share for the first quarter ending January 31, 1961, a drop from the same quarter a year before.

MERGERS AND EXPANSIONS

C-E-I-R's newest merger is with Facts Consolidated of the West Coast. In recent months other mergers have been with General Analysis Corp. of Los Angeles, Engleman & Co. of Washington, D. C.; and Data-Tech Corporation of Hartford, Conn.

Electronic Associates, Inc. has acquired Gorrell & Gorrell of Westwood, N. J. for cash and stock.

Litton Industries has acquired Hopkins Engineering Company of San Fernando, Cal.

Control Data's new corporate and computer division headquarters will be in East Industrial Park, Bloomington, Minn.

IBM will erect a new building in Dayton, N. J. to house the Supplies Division.

National Cash Register has bought a seven acre site in the Great Southwest Industrial District of Texas, at Arlington, for a new supply production plant.

COMPUTERS AND COMPUTING

The Electronic Systems Center of RCA, a year old, is operating at near capacity for firms in the New York financial district.

IBM's subsidiary, the Service Bureau Corporation, has a new data processing service for New York brokerage firms.

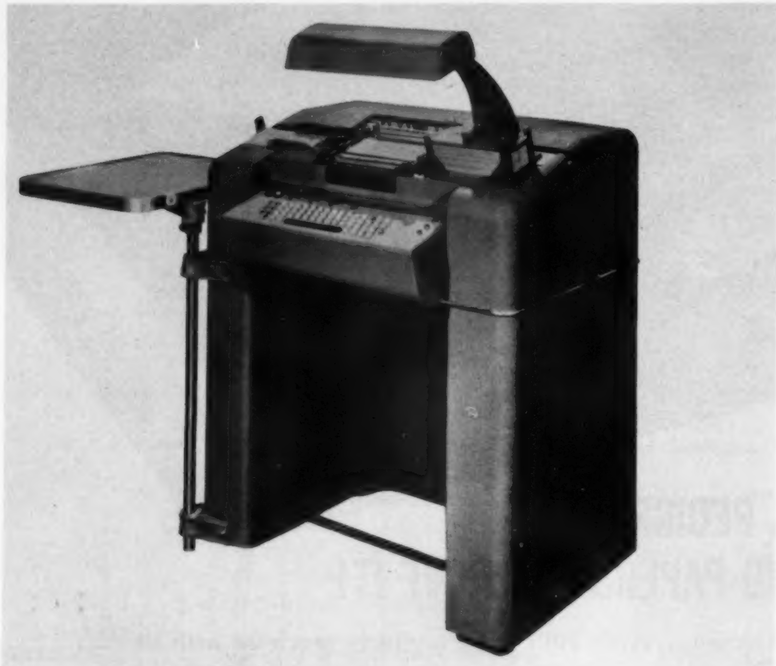
The Waterbury National Bank will use Bendix computers for their data processing, and will service many businesses as a by-product service center.

Another banking service center has been started in Summit, New Jersey, to be operated as Loudon Computer Service, Inc.

The University of Wisconsin has installed a Control Data two-computer system at the Numerical Analysis Laboratory. This system consists of the large 1601 and the desk size 160.

Denver & Rio Grande Western Railroad has completed installation of a Burroughs 220 system at its Denver headquarters.

NEW EQUIPMENT



R-R PHOTOELECTRIC VERIFIER

Remington Rand has a new photoelectric verifier in Type 2450, for input verification of 90 column punched cards. The 2450 includes adjustable margin stops. By setting a switch, the carriage upon contact with the right margin stop, automatically returns and shifts to lower register. Upon the second return to the right, the machine automatically feeds a new card for verification. Other features include an over-capacity verification key to check zero over-capacity punching.

The machine, in one pass, makes it possible to verify either the Univac 63 character code or the standard 90 column, 37 character code used by tabulating machines.

During verification each card is in full view of the operator, who keys the same information given on the card from the original source document. When a variation occurs, the keyboard locks and an error light flashes on. The operator can re-key and proceed if the error was hers—or reject the card if the error was in the punching. The card will automatically be delivered to the error receiver rather than the normal receiver.

Circle no. 30 on reader service card.

COMPUTER QUERY EQUIPMENT

TELautograph Corporation has new communications equipment that allows standard teletypewriters to make direct inquiries to electronic computers, either nearby or at long distance. The system utilizes standard components of Olivetti teletypewriter equipment for inquiry and reply linkage with an IBM RAMAC computer.

The production prototype of this new system has worked well for several months at Lockheed Aircraft in Burbank, California. There the RAMAC 305, with 40 million digit memory, is used to control job status information on the more than 60,000 open orders which are in the plant at any single time. Job progress is followed through 500 work load centers within the plant.

Key work centers, remote from the computer, can now request information from RAMAC simply by typing a request on the standard four bank keyboard of an Olivetti T2PN printing reperforator. This prepares a standard five-channel punched and interpreted paper tape. A small transmitter control unit, mounted on the T2PN, pre-programs the operation of the remote inquiring station for computer entry.

In the RAMAC center, a TELauto-

Mounted on a table alongside the IBM RAMAC 305 computer are two teletypewriter receivers. One monitors incoming messages from distant points in the plant. The other monitors the computer's answers to the remote inquiry stations.

The box at the far right is an automatic selector which scans the network and automatically activates remote transmitters, accepting one message from each station, in rotation. The circuitry in this box makes it possible for a production man to type an inquiry and leave his machine. The system will pick up the message when it can handle it and will reply automatically.

The new TELautograph system makes it possible to generate inquiries to computers from virtually any distance—at minimum operation costs.

graph search unit, alerted by the remote control transmitter, scans the input stations, accepting messages alternately from each. Virtually any number of points could be established and even those stations which generate little traffic have equal opportunity for access to the computer.

Inquiry in the computer center is through an Olivetti T2CR receiver equipped with a T2PF reperforator. This unit presents messages on typed hard copy and simultaneously prepares a five-channel paper tape for direct entry to RAMAC.

When the desired information is located, RAMAC provides the answer, which is routed through a TELautograph translator. This equipment takes the computer code and translates it to standard telegraphic code and causes a five-channel paper tape to be punched and transmitted back to the inquiry station.

It is entirely feasible to connect a computer with remote operations across the country to provide these offices with the latest information.

Circle no. 31 on reader service card.

RECOMP III

The new Recomp III solid state digital computer was shown in December at the EJCC in New York City. The new machine has a 4,096 word magnetic disk memory; each word is 40 bits. The computer can handle more than 8000 instructions. It uses a simplified command list of 32 standard commands plus five compact floating point commands. Standard input and output is 10 characters per second by Friden Flexowriter or paper tape punch.

Use of the optional Facitape input/output equipment increases inputs to the computer to a rate of 600 characters a second and output to 150 characters a second.

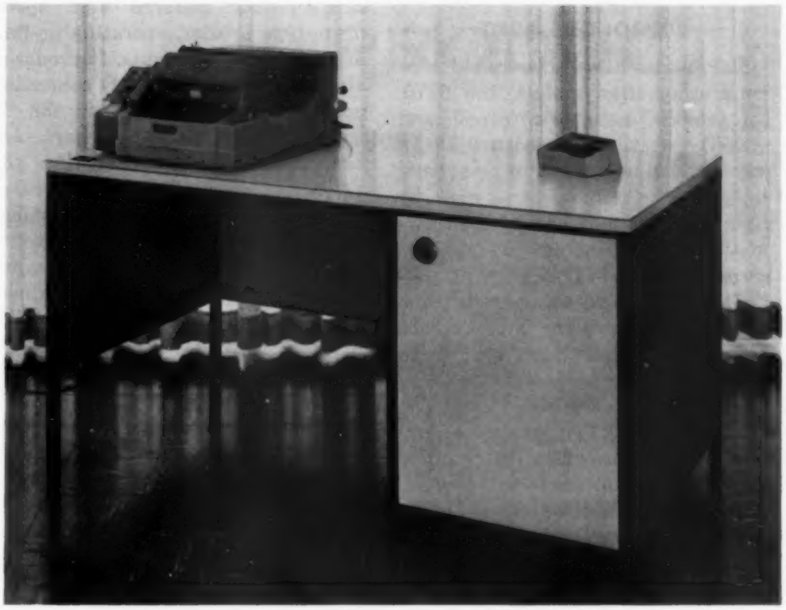
In addition, Recomp III provides four input and output plugs where additional optional equipment such as card readers, magnetic tape, line printers, and analog-to-digital converters can be used.

Main memory access time is 9.3 milliseconds; using the two high speed loops this time can be reduced to 1.75 milliseconds for add/subtract or 10.8 milliseconds for multiplication and 11.1 milliseconds for division.

Using the optional floating point, add/subtract time is 1.1 milliseconds; multiplication, 12.4 milliseconds; and division, 12.7 milliseconds.

Recomp is made by the Industrial Products organization of Autonetics, a division of North American Aviation, Inc.

Circle no. 32 on reader service card.



(continued on next page)

BURROUGHS B270

Burroughs has announced a new bank automation system, the B270, to provide automatic proof and transit operations. In addition, it can convert "on-us" items to magnetic tapes for further processing by computer, and may be used for automatic deposit analysis as well as account reconciliation services.

The B270 combines magnetic ink character recognition (MICR) with high speed document sorting, multiple list printing and solid state electronics. The system consists of:

B270 Central Processor, which is a fully transistorized, solid state electronic digital computer. It operates in three address command internally stored program and provides 4,800 individually addressable positions of magnetic core storage.

B122 Card Reader is an on-line photoelectric punched card reader with an immediate access clutch providing an operating speed of 200 cards a minute. One card reader is required in the B270 system.

B102 Sorter-Reader reads magnetically encoded information and sorts paper documents at speeds up to 1,560 a minute. The sorter-reader operates in two modes: on-line, where it is under control of the central processor, and off-line, where it operates as a high speed digital sorter. It includes an optical scanner for batch ticket detection.

B322 Multiple Tape Lister. This is a completely buffered high speed drum-type printer, operating on-line at 1,600 words a minute. It produces six listings, independently controlled and spaced, with provision for 22 positions of printing at 10 characters per horizontal inch and six lines per vertical inch. Printing is provided for 10 numerals, 10 specific alphabetic characters, and four special symbols. The system can accommodate up to two multiple tape listers for a total of 12 listings, which provides pocket listings as designated for the sorter-reader.

B421 Magnetic Tape Unit. A reel type magnetic tape unit that reads/writes at 41,600 characters a second. Recording is on one-half inch magnetic tapes, 3,600 feet in length. Start/stop time is five milliseconds. Dual gap read/write heads provide longitudinal and vertical parity checking. Data is recorded in single frame alphanumeric representation. The system can accommodate up to six magnetic tape units.

Circle no. 33 on reader service card.

■ ■ ■

DEPARIS

(continued from page 28)

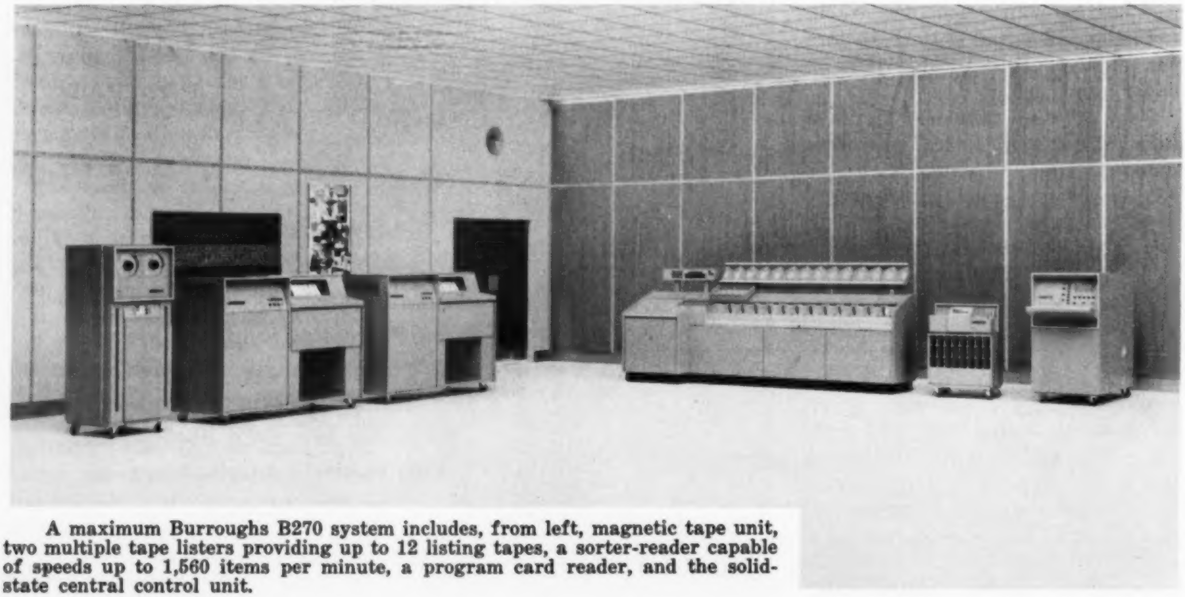
mum-quantity deck, retaining the flags. Plug SEMA into 403 and list closing inventory with symbols for items flagged as below the re-order point.

5. Then plug SEMA into collator and subtract-load today's payments. Then add-load yesterday's accounts receivable balances, selecting into pocket 1 those balance cards for which there was activity today. Plug SEMA into 403 and list accounts receivable trial balance. Plug SEMA into reproducer and punch out new accounts receivable balance cards for the accounts having activity today. These replace the cards which were selected into pocket 1 earlier.
6. Plug SEMA into 403 or reproducer and print or punch dollar sales by salesman, or plug SEMA into 403 and 514 into SEMA; then as 403 prints dollar sales by salesman, a summary card can be punched on the 514.

So much for SEMA, an attachment with a bright future. Next month we'll discuss some other devices designed to get more out of your punched card equipment.

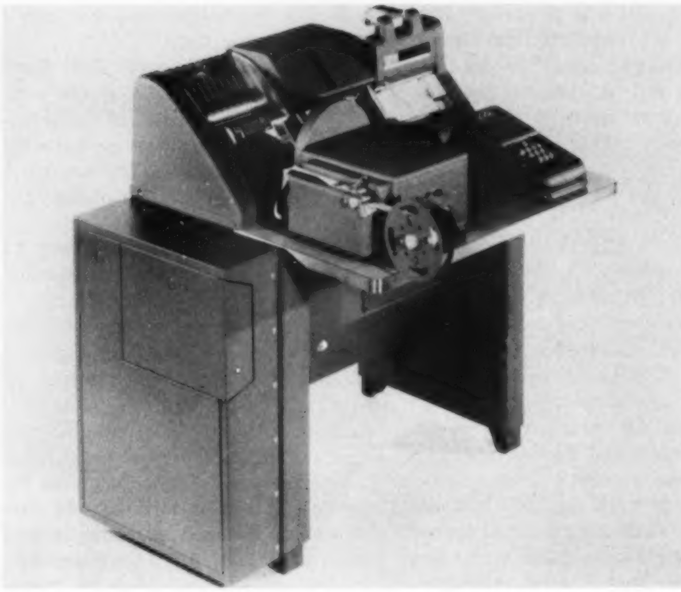
(The concluding article in this two-part series will appear in next month's issue.)

■ ■ ■



A maximum Burroughs B270 system includes, from left, magnetic tape unit, two multiple tape listers providing up to 12 listing tapes, a sorter-reader capable of speeds up to 1,560 items per minute, a program card reader, and the solid-state central control unit.

PRODUCTS SERVICES



PAPER TAPE

Radio Corporation of America has solved the problem of "phantom holes" caused by oil spots on paper tape by a new tape reader. The 322 Tape Reader ignores everything but true perforations through use of photoelectric scanning and improved circuitry. The tape equipment comes in two models: one, a tape reader only; the other can read as well as punch. The reader can scan perforated tape at rates up to 1,000 data characters per second, handling five, six or seven-channel formats plus parity check.

The 322 resembles a secretary desk and comes in Shadow Blue, Midnight Blue and Sunset Red.

Circle no. 40 on reader service card.

TAPE AUTOMATIC PREPARATION EQUIPMENT

TAPE (Tape Automatic Preparation Equipment) is produced by McDonnell Aircraft Corporation. The purpose of this equipment is to produce perfect punched tape at less than half the cost and in less than one-third the time required, by ability to automatically program the punched tape. The machine's logic circuitry analyzes word-group and key board commands, converting them to complete coded programs. Finished tape is delivered instantly by punching mechanisms.

Circle no. 41 on reader service card.

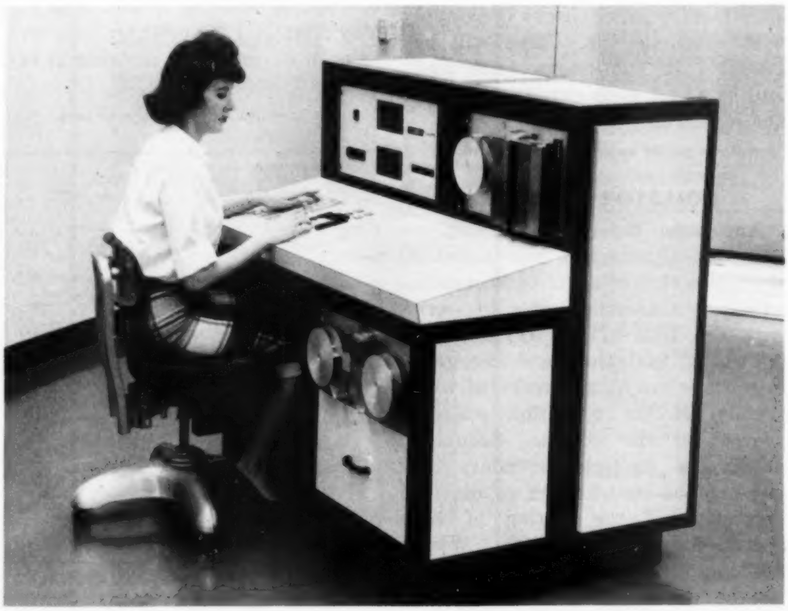
SYSTEMATICS CONVERTER

Systematics announced the K-177 Universal Code Card to Tape Converter which perforates five, six, seven, or eight channel tape of any code structure and of any width from 11/16 of an inch to one inch.

The K-177 is made for attachment to any IBM 024 or 026 card punch, which then does double duty as keypunch and card to tape converter. The system shifts from card conversion to manual keypunching by switching off the power switch of the K-177.

Another feature of the K-177, the 540 double-hub removable programming plugboard, permits plug-in reprogramming for different applications. The converter consists of a tape punch and a control module. The control module houses all converting and programming circuits and the plugboard.

Circle no. 42 on reader service card.



DURABLE MAGNETIC TAPE

IBM has announced H-D (heavy duty) magnetic tape which can be used with their 727, 729, 7330, 7701 and 7765 tape drives. It is available in 1,200 and 2,400 foot lengths and accepts up to 556 characters per inch. A 1,200 foot length of H-D magnetic tape, including tape, plastic reel and plastic container, costs \$29.00; a 2,400 length is \$43.00.

Circle no. 43 on reader service card.

TRANSLATERS

Honeywell announced the development of electronic converters that automatically translate records on magnetic tape from IBM and Univac language to Honeywell language. The IBM converter is in operation at the division's service bureau in Wellesley, Mass. The Univac trans-

later will soon be ready.

The 831 is for Univac and the 832 for IBM translations.

Tape units of other companies read their tapes into the proper converter, which converts the signals into language readable by the Honeywell 800. At present the converters will be used in the service bureau only.

Circle no. 44 on reader service card.

CRAM

National Cash Register has a new generation memory file for use with its 315 data processing system. This device, Card Random Access Memory (CRAM), employs a removable cartridge containing 256 magnetic cards on which information can be stored and read at random in a sixth of a second.

The cards used with CRAM are plastic, 14 inches long and 3¼ inches wide. They are suspended from eight two-position rods in a removable cartridge, each cartridge contains 256 cards. It takes about 15 seconds to replace a cartridge.

In operation, the two-position rods turn in such a combination that the selected card is released onto a rotating drum where it is read or written on at the rate of 100,000 alphanumerical characters a second. Information is magnetically recorded on one of seven vertical tracks on the card. The computer also selects the recording track for reading or writing data.

NCR's Card Random Access Memory file is expanded in a few seconds by replacement of its 8.3 million digit memory cartridge. A cartridge contains a "deck" of 256 magnetic cards on which information can be stored and selected from any card by an NCR 315 computer in one-sixth of a second.

Each magnetic card can store 21,700 alphanumeric characters or 32,550 decimal digits of information, providing a storage capacity of over 5.5 million alphanumeric characters of 8.3 million digits in a single cartridge.

Up to 16 CRAM units can be operated in a 315 computer system. In addition to the CRAM units, the 315 can also control up to eight magnetic tape units. Cartridges of magnetic cards are interchangeable between CRAM units in much the same way that reels of tape are interchanged.

In random storage, access time for any card is 170 milliseconds. Re-access of a card already in the write/read station is 14 milliseconds. Further speed can be had by "time-sharing", which enables the next card to be selected while processing is being completed on a card. In sequential use, one magnetic card unit can perform several sorting tasks. CRAM is priced at $38,000, rental is about $950.00 a month. CRAM will be available for delivery early in 1962, along with the 315 computer.

Circle no. 45 on reader service card.

IBM MICR CHECKS

IBM has announced that it will manufacture paper checks imprinted with magnetic ink. These will be available in continuous form and unit sets in a wide variety of colors and styles.

Circle on. 46 on reader service card.

KOLLATOR KONTROL

Automatic Information Products Company announce a new Kollator Kontrol which consists of a console unit and connecting cable to work with any IBM 077 or 085 collator. All basic matching and merging operations can be accomplished with a turn of the operation selector switch on the console. Sequence check and multiple secondary select may be switched off or on, independent of the setting of the operation selector switch. When needed, other special collator jobs can be wired on the control panel

without removing the Kollator Kontrol wires.

Circle no. 47 on reader service card.

ASSOCIATED DATA CENTER, INC.

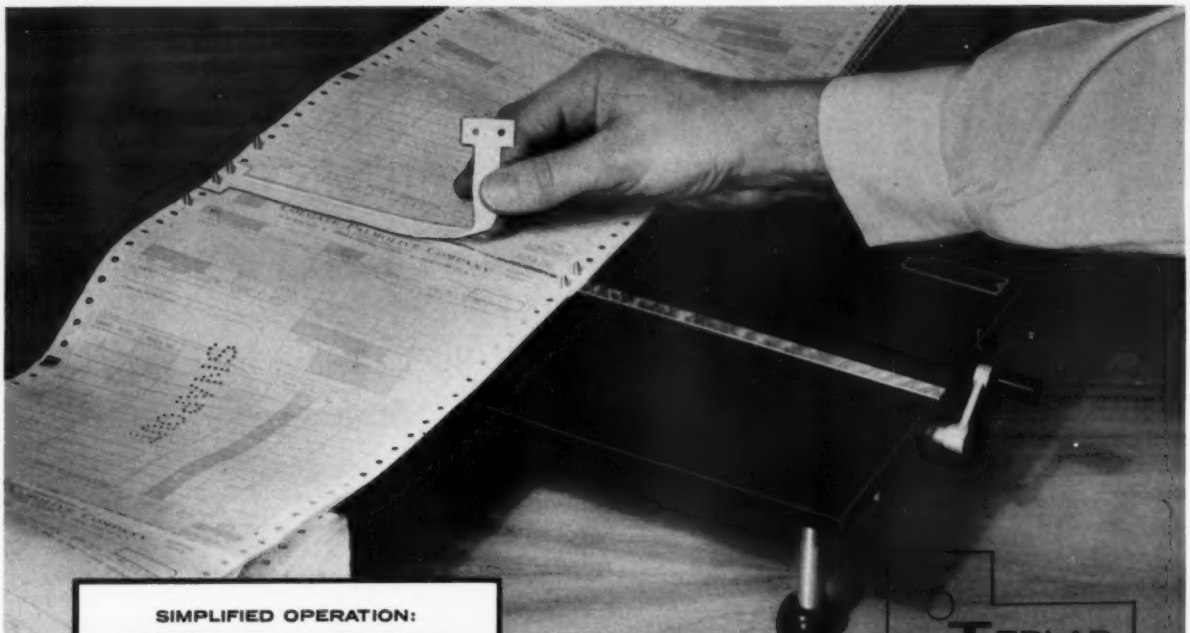
A new data processing group, Associated Data Center, Inc., has been announced. This is the only national organization of independent data processing service companies. ADC companies stress the highest standard of quality and service, and select as affiliates only those firms that meet the association's standards, and who qualify as *small business* (as defined by the Small Business Act of 1958). ADC services include data processing services ranging from basic punched card to large computer programming and processing. Affiliated companies are:

Electronic Data Processing Corp., Philadelphia, Pa.; Punch Card Service, Inc., New York City; Tabulating Service Companies, Baltimore, Md.; Malt & Ness, Buffalo, N. Y.; Data Processing Services, Richmond, Va.; American Tabulating Co., Englewood Cliffs, N. J.; Data Computing Service, Easton, Pa.; Machine Accounting Inc., Lansford, Pa.

A spring meeting is scheduled for May 21st in Philadelphia; this will be open to companies desiring to become affiliated with ADC.

Circle no. 48 on reader service card.

"REMIND FRIDLY, THAT THE DIGITAL COMPUTER IS NOT A PINBALL MACHINE!"

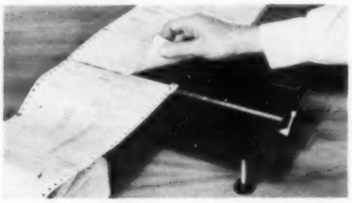


(PAT. APP. FOR)

SIMPLIFIED OPERATION:

1—Turn gear shaft handle which adjusts joiner pins to correct width of punch holes on form.

2—Apply strip of pressure-sensitive tape (adhesive side up) to pins.



3—Butt trail end with lead end of packs in position on pins.

4—Seal ends with second strip of tape. (Tape is perforated down center for easy separation).

This precision instrument eliminates wasteful short strips of forms! Speeds up production!

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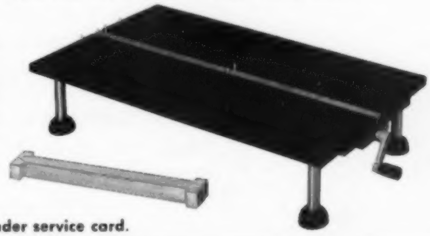

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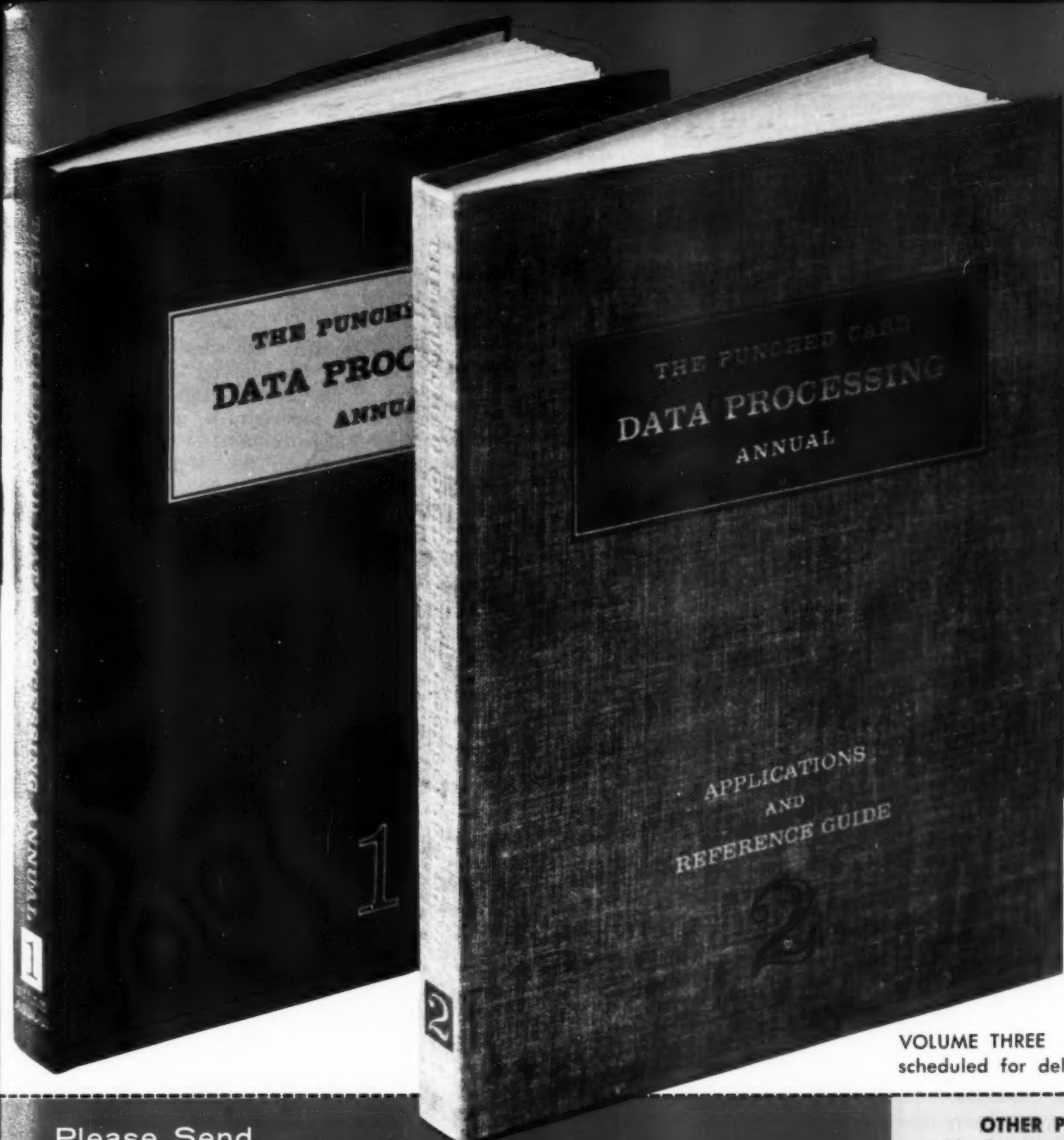

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RAYMOND DREYFACK

How's Your DQ?

(Decision Quotient)

WE'RE no better than we decide we are. Assuming competence, the complementing quality needed for success is confidence. Competence plus confidence adds up to decision-making ability — and that's what it takes to get ahead.

This applies to the manager of the data processing department as surely as it does to the vice president in charge of opening the mail.

Know-how plus confidence. The know-how at least should be duck's soup to anyone with systems experience. Know-how is the accumulation and recording of facts, and facts to the systems man are the equivalent of hammers, screwdrivers and saws to the carpenter.

Without the facts it's pretty obvious that a wise decision can't be made. Yet an amazing number of people put important decisions into effect with vital gaps existing in their fact armour. Often, when a person can't seem to decide something one way or the other it's because he's inadequately armed with information, but doesn't realize it. At this point the wisest decision one can make is to postpone final consideration until the vacancy has been filled in the mind. Once the vacancy has been satisfactorily occupied the confidence will appear as a by-product.

Making decisions

Let's study a case in point. A data processing manager is faced with the problem: to order a computer or not. Anyone in this business knows this is one of the toughest decisions to make. *Why* is it so tough? Isn't it simply because the feasibility study involves so many *more* facts than we're accustomed to absorbing on one project or consideration?

Sometimes gathering facts isn't quite enough. Without careful evaluation facts may be useless, or even detrimental. A fact is like a many faceted diamond. We have to appraise it carefully to make sure no flaws exist.

Joe Hosie, crack IBM instructor at the Endicott customer education center, likes to ask his classes: "Which weighs more: an ounce of gold or an ounce of feathers?"

Maybe you've heard this before, but invariably someone will blurt out: "They're both the some."

At this point Joe smilingly explains that, since gold is measured in Troy weight at 480 grains to the ounce, and feathers in avoirdupois at 437½, an ounce of gold is heavier.

He'll next ask, that infectious grin not faltering a fraction, which is heavier, a pound of gold or a pound of feathers.

Someone will now pop out *(probably the some guy)* that a pound of gold is the obvious answer, since gold has more grains to the ounce.

"But," Joe points out, "a Troy pound contains only 12 ounces, whereas an avoirdupois pound adds up to 16."

So, even though an ounce of gold is heavier than an ounce of feathers, a pound of gold is lighter. At which juncture Joe will forcefully drive home the story's little moral.

"Get the facts, man. *All* the facts."

That's what's needed to make a wise decision as well — *all* the facts.

Facts plus

Other things are needed too, depending on the nature and importance of the problem. If the decision involves moral or emotional factors instinct will also figure heavily, plus your innate sense of right and wrong.

You have to decide, for example, between Harry and Bill for that new assistant's job. Which one do you choose?

Well, first, in terms of fact accumulation, we know that Bill is highly competent in his work, extremely well liked, and has been a long time on the job. Harry, while also competent, has somewhat less experience and shorter seniority. Though he hasn't attained Bill's degree of popularity he gets along fairly well with people.

Based strictly on the facts Bill comes out ahead. But probing a little deeper more subtle considerations begin to appear. These can't be readily posted to the employee record. They have to do with loyalty, character and integrity.

Harry is always right behind you without reservations when you need him. Comes a snowstorm, for instance, at the rough time of the month, and he'll get into work even though his transportation set-up is more difficult than Bill's. Bill, on the other hand, will call in later with some long sad story of his rigors on the snowpile, but Harry is the one who shows up. Another thing. If Harry makes an honest error he'll honestly admit it. Bill will go to great lengths to "cover up," make excuses, and for all his show of interest, his true concern doesn't match Harry's.

In this case then, instincts connected with loyalty and character outweigh the factors involving experience and seniority.

Another problem regarding decisions is that every so often you find yourself forced into making a judgment against your will. Sometimes, squirming out of such a situation is as much an art as coming up with a quick answer.

If a decision is an important one, permitting yourself to be forced into it before you're ready can really cost. If you feel any reservations at all, and if you're unable to defer the decision, the only logical thing you can do then is set all your cards on the table. Show *why* you're seeking to postpone your answer.

For example, your boss is pressing for a new job to start the beginning of the month. But you have your doubts. You may be able to get the project on the air, but you're

not sure. You'll have to do a little more analyzing, and will know better in a few days. So, what do you do? The best tack is to come right out in the open with your reservations. Explain what could result if the starting date is premature. The problems that could foul up the normal routine, undermine the system, weaken confidence and morale. Most of the time, if your boss understands *why* you're trying to defer your decision he'll go along with your judgment.

But, don't forget, to a certain degree, it's his job to prod you into decisions, and if he simply believes you're giving him the old stall, he'll prod you that much harder.

Just one more factor. Most important in decision-making is good old-fashioned "guts." You need your convictions, and you need the courage of your convictions.

This too will come as a by-product if you can ask yourself this question and answer affirmatively: "Are my decision-making considerations geared to the best interests and objectives of my company instead of being motivated by selfish personal factors?"

Test your decision after it has been made. If a sense of personal well-being is there it's a good sign that the decision was a right one. If nagging doubts and reservations persist, watch out — a reexamination of the facts and values may be called for.

■ ■ ■

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yours for the asking

CLARY CORPORATION has a new 24 page illustrated brochure entitled, "This Is the New Clary," describing products in a growing line of computer and data handling equipment.

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DIGITRONICS Corporation has new descriptive literature available on its Dial-O-Verter system, the system which functions with the Bell System Data-Phone 200. The brochure includes photographs.

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ELECTRONIC ENGINEERING Company of California has a second edition of the Short Form Catalog describing new product lines in the fields — time code generators, timing systems auxiliary equipment, search and control systems for magnetic tape transports, data handling equipment and automation equipment.

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THE FOUNDATION FOR MANAGEMENT RESEARCH has just issued a fourth edition of its popular study on equipment leasing, "Pros and Cons of Leasing." Included are new tables and charts analyzing the comparative costs of leasing, outright cash purchase, purchase by conditional sales contract, and purchase through bank financing. Specific situations where it is advantageous and disadvantageous to lease equipment are analyzed.

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INDUSTRIAL MANAGEMENT SOCIETY'S film rental catalog has 88 keys to work simplification and industrial engineering techniques.

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PHILCO CORPORATION has a number of new booklets which describe or outline: What to do before installing a computer system; this five page booklet is in non-technical language which details system analysis, specifications, design and full operation of the computer.

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The operation of FRED, a relocatable dump routine which may be used as a general dump routine or as a snapshot routine.

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Macro instructions and their function of storing and executing input output orders.

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Routines to create, add to, delete from, replace and list TAC libraries.

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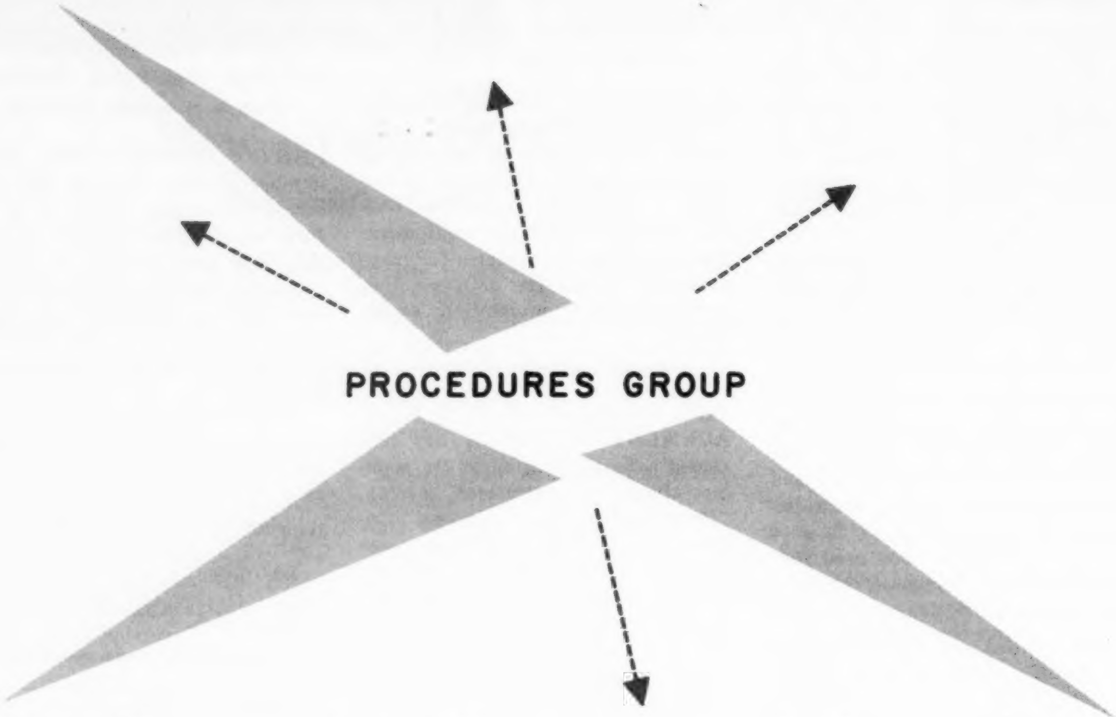

Data Processing Systems and Procedures

The "right hand" of data processing management

By Dr. S. W. Brossman

ONE OF THE MOST ELUSIVE ARTS I know is found not in museums or concert halls, but in data processing industries with large and complex procedures for the routing and processing of the business at hand. Intuition and experience are the stuff of which judgment is made, and intuition plays a large role in keeping the intricate systems machinery functioning at top efficiency.

In the data processing department, for example, the nerve center of its entire operation should be the procedures group. While this group is certainly not the brains of the outfit, it does have the responsibility of responding to signs of breakdown in the data processing organism, reacting to needs of this or that part of the system, communicating instructions to every limb and organ of the department, and carrying back impressions to the management brain. In a very real sense, data processing management is only as good as its systems and procedures. And systems and procedures need a great deal of constant scrutiny and maintenance to be any good at all.

The business of the procedures group is the machinery by which data processing gets its job done. And this group isn't as interested in the data processing job itself as it is in the way in which the job gets done.

Now, it isn't enough for the procedures group simply to repair the machinery when it breaks down or to put a drop of oil in the works now and then to keep it going. First of all, this group must understand the very nature and purpose of the department. Then and only then can it make specific recommendations for system changes in anticipation of trouble, not after trouble has manifested itself.

Procedures doctor

To do this, the procedures man must be a diagnostician, a trouble-shooter, a snooper, a systems mechanic, a staff assistant, and a soothsayer all rolled up in one. And he must be able to make up his mind and get his ideas across. Too often the ideas for systems maintenance do not originate with the procedures group at all, but with management. This is 180 degrees out of phase with maximum management efficiency.

Ideally, the function of management is to judge men and to make decisions. In judging personali-

ties the administrative manager must attract the right kind of supervisors to bring his solutions to problems. And in making decisions he must select the right solutions from among those presented. A manager may ask three assistants for solutions to the same problem, but each assistant should bring back only one positive decision. If all a top-level data processing manager ever did was pick the right supervisors and make the right decisions, he'd be worth a fortune to his company. But if he had to uncover problems for himself, suggest alternate solutions, and then write the memos too, he'd be dissipating his usefulness to his company.

Aid to management

The purpose of the procedures group is to leave management free to run the show. And the only way the group can do this is to bring to management not only the problem but also the solution, as well as the written directive, ready for management's signature.

The procedures group, therefore, must contain:

1. Thoughtful and experienced men who have a thorough knowledge of data processing systems.
2. Careful detail men who can iron out wrinkles and write meaningful and understandable sentences.
3. A hardworking and competent leadman.
4. A supervisor who can organize the team and lead the assault on a problem, who can assess and correlate different points of view, who can recommend a clear and direct course of action for management to take—and who can maintain a reasonably high batting average for the soundness of his recommendations. One supervisor you don't want is the guy who dreads his turn at bat.

As in most operations, the key to the procedures group is its boss. If his organization is sound he should be able to manage his outfit with an average of about an hour a day. Several days a month should be sufficient to keep up contacts in outside professional organizations. Up to one week a month, on the average, may be needed for government and customer contacts. But the real meat of his work is the remainder—a minimum of half his time—which should be concentrated on diagnosing, simplifying, and adjusting data procesing systems and procedures by means of sniffing, snooping, asking, pondering, and recommending.

The ideal procedures group supervisor is a man who dotes on problems, who thrives on management and who eats organization for lunch. He is a tactful and a careful person, who, with all his capacity for patience, is itching to get the job done. In short, he does not exist. The problem always, of course, is to find a reasonable facsimile. ■

SEEN IN PRINT

PERF-O-DATA, A LEGIBLE PERFORATED CODE, Data Processing (British quarterly), January-March, 1961.

Symbols that can be read by both men and machines were the aim of magnetic ink codes, but those are expensive. Less expensive is an alternate system called Perf-O-Data in which legible outlines of arabic numerals are formed by punching patterns of holes through documents. Punches, reproducing punches, readers and sorters have been developed for preparing and handling documents using this perforated code. Among advantages claimed for this method are moderate capital costs, quick document preparation, easily identified codes. Also the perforated data can be transcribed on other documents such as punched cards and punched paper tape, allowing further processing through existing machine installations.

INVENTORY MANAGEMENT—AN APPLICATION OF THE EXCEPTION PRINCIPLE by Doyle W. Selden. N.A.A. Bulletin, December, 1960.

The need to reduce the number of Navy aircraft grounded for repair parts sparked the more-than-nationwide program reported in this article. Under this new system, frequent mechanized processing of repair parts records is supplemented immediately by evaluation of exceptions to adequate stock — and by prompt and aggressive corrective measures. The author views the program as widely adaptable to inventory control problems.

DATA PROCESSING FOR SMALL CLIENTS by Raymond A. Crovatto, Journal of Accountancy, December, 1960.

The introduction of relatively inexpensive adding machines that simultaneously produce punched paper tape makes it feasible for even quite small businesses to obtain benefits of automatic data processing by service bureaus. On the basis of his own firm's experience, the author discusses the factors to be considered in selecting a service bureau, steps necessary to convert to automated methods, preparation of data for processing, and touches to reports received from service bureaus before delivery to clients. ■

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BOOK SHELF

DECISION MODELS FOR INVENTORY MANAGEMENT by Robert B. Fetter and Winston C. Dalleck, Richard D. Irwin, Inc., Homewood, Ill., 1961, 125 pages, $5.75.

This book is designed as a guide for the interested and reasonably sophisticated operations analyst whose primary concern is the analysis of problems in inventory management.

The book provides such an analyst with the approach to the analysis of his problem through model formulation, data collection and analysis and solution. The solution should include the optimum inventory as the goal, with the rules formulated to produce answers as to how much inventory to carry: enough so that demand can be met, but not so much that the relative costs of carrying the inventory are excessive to demand.

The book is divided into three parts plus appendices which include a glossary. Part one takes up inventory decision models: basic EOQ model—purchased lots; production lots; variation in demand; procural problems; and sensitivity analysis.

Part two deals with input data: costs and prices which include ordering, carrying and depletion costs; demand and lead time; and the Monte Carlo method.

Part three covers illustrative cases: basic EOQ model, production EOQ model; variable demand and lead time; quantity discounts; an integrated computer-oriented inventory management system; and a case study.

SUCCESSFUL MANAGERIAL CONTROL BY RATIO-ANALYSIS by Spencer A. Tucker, McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y., 1961, 434 pages, $11.00.

"Years ago, one company could successfully compete against another by having lower hourly labor rates or because it paid less for materials. Not so Today. Now the competitive battleground is in the tiny, elusive, and sometimes hidden areas of manufacturing concerns. *Profit making* now comes from constantly unmasking hidden costs or negative acts, from policing and guarding against insidious creeping change, from lighting up a hitherto unknown profit area. Today managerial inertia is a disease. Fact finding is vital.

"Profit planning requires much more than these efforts. Profit planning for the longer term must include action for growth and survival."

To keep the company in business and healthy, the author advocates the need for managerial control—MC—which is reliant on data not always in the usual financial statements. MC is a technique of reducing company data to significant ratios and interrelating their movement.

First, ratios are developed which evaluate facets of the economy which are vital to the company life and growth. Then control is provided by acting on the interrelationship of the movement of the ratios.

Explaining this, the author divides his book into: how to get effective management; tools for ratios and controls; elementary ratios for evaluating production; advanced ratios; managerial control of production; evaluation and control of sales effort; ratios for sales effort; sales ratios for evaluating product activity; evaluation and control of the sales function; integration of production and sales; financial management; evaluation of the capital structure; and integration of the activities of production, sales, and capital.

Although the book deals primarily with manufacturing, the same techniques are applicable to transportation and distribution, warehousing, and wholesaling. ■

editorial

THE USE of electronic data processing equipment offers an opportunity to deal more effectively than ever before with one of the long-standing and perplexing problems of management, namely, supplying accurate data to those who, as supervisors and executives, need and will use these data to make informed decisions. Electronic data processing does nothing if it does not assure an orderly flow of meaningful data for use in more effectively managing the multi-faceted activities of business.

In seeking to provide this, those who help to engineer the changes had best avoid becoming enamored of hardware. **It is not hardware that gets the job done;** it is systems — conceived in breadth and developed with clear objectives in mind. He who gets a fixation on equipment is in for trouble. Data development is systems oriented, not machine oriented, and when you ask too much of a machine, or distort your needs to fit equipment, to that extent are you unfaithful to your job.

One of the most essential ingredients that must be present is common purpose, coordination, cooperation or teamwork, in fact it is indispensable in an electronic data processing program.

When electronic data processing equipment is being considered for any business — organizational lines, functional lines, geographic lines, and even professional lines which have presented barriers to efficient data processing systems in the past, no longer can be permitted to obstruct the orderly and effective use of an electronic data processing system.

If the broad systems approach is pursued with the inevitable integration of the data processing system and if the system is coordinated and integrated on a company wide basis, then compartmentalization will have to stand aside, artificial boundary lines will have to disappear and experts in science, engineering, finance, accounting, personnel, management analysis and many other functional or professional fields will find that the only course to follow is one which involves a common effort. ■